

35 cents per copy.

# ROCKS and MINERALS

Vol. 3

DECEMBER, 1928

No. 4



Prospecting for placer gold—Happy Day Placer, Divide, Melrose Mining District, Montana. (See ROMANCE OF ROCKS AND MINERALS, page 105.)

## SPECIAL ARTICLES

JELLY CHEMISTRY. By Edward Cahen.

WESTERN NEW YORK CONODONTS. By Raymond R. Hibbard.

THE ROMANCE OF ROCKS AND MINERALS. By Dr. R. F. H. Harter.

WHERE AND HOW TO FIND MINERALS. By Morrell G. Biernbaum.

THE MAGAZINE FOR COLLECTORS

# THE BULLETIN BOARD

## What Our Members are Doing for ROCKS AND MINERALS

Articles of the last issue of **ROCKS AND MINERALS** have been reprinted in full or in part and reference made to them both by publications in this country and abroad. It is due to the interest and cooperation of some of our subscribers that this has been made possible and we owe them many thanks. Among the publications mentioning **ROCKS AND MINERALS** are:

*Discovery*, a monthly popular journal of knowledge, printed in London, England, gives a brief review of the character and purpose of **ROCKS AND MINERALS**.

*Rock Products*, a magazine devoted to the rock industries, is reprinting the article on the dolomitic limestone for which the \$5,000 reward is offered.

*The Jewelers Circular*, a prominent jewelers' magazine, gives a brief review of the magazine and calls attention to the "Compilation of Gem Names" and the "Gem Department."

*The Saratogian*, a daily newspaper of Saratoga Springs, N. Y., in its issue of October 5th reprints the article by C. A. Hartnagel, Assistant State Geologist, on "Stark's Knob," introducing it with the editorial comment in **ROCKS AND MINERALS**. The article on Stark's Knob was called to the attention of the Editor of *The Saratogian* by Miss Nellie C. Barrett, an esteemed and loyal member of the **Rocks and Minerals Association**. Miss Barrett is very much interested in the magazine and is recommending it to those who love the great outdoors.

There are articles in **ROCKS AND MINERALS** which would be of interest locally if our readers would call the attention of the Editors of local publications to them. **ROCKS AND MINERALS** is a copyrighted magazine but we have no objections to the reprinting of articles, either in part or

in full, if proper credit is given. One of the purposes of the magazine is to create an interest in minerals and mineral collecting and we feel that the reprinting of articles of interest in other magazines or newspapers is a great aid in furthering our purpose.

We are in receipt of two letters which have been not only an inspiration but of great satisfaction to us. Mr. Francis Dakin of Dalton, Mass., who is now in the Colorado School of Mines, Golden, Colo., has written us: "**ROCKS AND MINERALS** did a great deal in convincing me that mining is a fine profession and that the study of minerals is a most interesting subject. I would be very glad to have others profit from my experience."

Mr. George R. Heyl of Allentown, Pa., now a student in the Pennsylvania State College, State College, Pa., in writing to the Editor concerning his course said: "I am taking up geology and am therefore enrolled in the School of Mines. **ROCKS AND MINERALS** has undoubtedly influenced me to take up this course for I have always read it eagerly."

We feel that these two young men have chosen a most worthwhile profession from which they will derive much pleasure and satisfaction. We wish them both success in college and the field they will enter after graduation.

In thus influencing two bright young men in the choice of a profession we feel that **ROCKS AND MINERALS** is not published in vain.

MERRY CHRISTMAS  
and  
HAPPY NEW YEAR

to all our readers and members. May Santa Claus put some choice mineral specimens in your stocking.

**WANTED:** Correspondents in all parts of the world who will be kind enough to send us notes and news items on minerals, etc., that they

think may be interesting to the subscribers of "**Rocks and Minerals**." Such as are available we shall be very glad to print in the magazine.



Pul  
Qu

Vo

Wi  
Th  
Mi  
Jel  
Wo  
Ph  
Zee  
Pe  
Mi  
W  
A  
U.  
Th  
Pu  
W  
Th  
Ed

gra  
giv  
AN

Sa  
sul

on

ne

R

# ROCKS AND MINERALS

## *The Magazine for Collectors*

Published  
Quarterly

Peter Zodac  
Editor and Publisher

---

*The Official Journal of The Rocks and Minerals Association*

---

Vol. 3

DECEMBER, 1928

No. 4

---

### CONTENTS

	Page
Where and How to Find Minerals .....	101
The Romance of Rocks and Minerals .....	105
Mineral Localities of Colorado .....	110
Jelly Chemistry .....	112
Western New York Conodonts .....	117
Phosphorescence of Minerals .....	120
Zeolites .....	124
Petalite at Peru, Maine .....	125
Micro-Chemical Study of the Metallic Ores and Minerals .....	126
With Our Contributors .....	127
A Compilation of Gem Names .....	128
U. S. Civil Service Opportunities .....	129
The Gem Department .....	130
Publications Recently Received .....	131
With Our Members .....	132
The Sluice Box .....	133
Editorial .....	134

---

Entered as second-class matter September 13, 1926, at the Post Office at Peekskill, N. Y., under the Act of March 3, 1879.

Copyright 1928, by Peter Zodac

Title registered in U. S. Patent Office.

---

Authors alone are responsible for statements made and opinions expressed in their respective articles.

---

Specially written articles (as Contributions) are desired. Permission will be granted for reprints from ROCKS AND MINERALS upon application. Credit must be given as follows: "Reprinted from the (state the month and year) issue of ROCKS AND MINERALS, Peekskill, N. Y."

Subscription price is \$1 per year in U. S. and Possessions; foreign \$1.25. Sample copies and back numbers, 35 cents per copy. No responsibility is assumed for subscriptions paid to agents, and it is best to remit directly to the Publisher.

Issued on the 1st day of March, June, September, and December. Forms close on the 20th of January, April, July, and October.

Changes of address should be sent in at least two weeks before the date of the next issue of ROCKS AND MINERALS, in order to be effective for that number.

**ROCKS AND MINERALS**

**PEEKSKILL, N. Y., U. S. A.**

## SUPERFINE MINERALS FOR SALE!

Azurite—Cassiterite—Celestite, beautiful crystals, 30c up.  
Chalcopyrite, xled on Dolomite, \$1—Fluorite, xled—Precious Opal.  
Native Lead, rare!—Smithsonite, fine green—Rock Crystal groups, \$3.50.  
Sphalerite

I would like to send approval lots to responsible collectors. Write me now!

**E. M. GUNNELL**

595 East Losey Street

Galesburg, Ill., U. S. A.

## FOSSILS

Cephalopods, Gasteropods, Pelecypods, Echinoderms, Trilobites, Brachipods. Absolutely authentic identification. Complete data with annotations.

### Special Introductory Offer

Ten extra nice specimens, all different, including a beautiful Sea Urchin—only \$3.75. Or, five Pelecypods and five Brachipods, each of a different type, at \$2.50 for the ten. Orders will be sent prepaid by insured parcels post. Satisfaction guaranteed. Write for descriptive lists and prices.

**JNO. B. LITSEY**

P. O. Box 487,

Dallas, Texas

Dealers—Collectors—Schools and Colleges—Everywhere. Send for lists of fossils, and crystallized Nevada and California minerals.

**H. G. CLINTON**

Manhattan, Nevada

U. S. A.

## CABOCHON GEMS

30 Cents and Up

Or cabochon gems cut from your material at a nominal charge. Special—Gem Prehnite, heart-shaped, \$1.00 Small cabinet specimens cut and polished.

### THE CLINTON LAPIDARY

712 South Ave. Westfield, New Jersey

## SHOWY CRYSTALLIZED MINERALS FROM ALASKA

1x1½—2x3 15c, 25c, 30c

Minerals from Washington, Oregon, Idaho and other western states, 5c and 10c. Opalized and Agatized Wood, Petrified Wood and Bark, Jaspers, Chalcedony and Agates from the Pacific Coast and Olympia Peninsula, 10c, 15c and 25c, postpaid.

**W. H. MATCHETT**

615 Fifth Street, Hoquiam, Wash.

### Minerals of the Tri-State District

Sphalerite, Galena, Calcite, Barite, Marcasite, Dolomite, Tripoli, Chert, and other minerals and rocks. Single specimens from 10 cents to \$1. Large Exhibition Specimens. Pure minerals for Chemical Manufacture.

Special prices for bulk material in 100 pound lots.

Evans W. Buskett, Box B1005, Joplin, Mo.

## DEALERS AND COLLECTORS DIRECTORY

Under the above heading, ROCKS AND MINERALS—beginning with the March, 1929, issue—will print a one-inch card of any collector or dealer desiring to exchange, purchase, or sell minerals—at the special rate of \$5 per year (four insertions). These cards should not contain much more than the name and address and character of the specimens desired or to be sold or exchanged. The card of Dr. Dake's, printed below, is a good form to adopt.

**DR. H. C. DAKE**

*Mineral Collector*

793½ Thurman St., Portland, Ore.

*Correspondence Invited.*

P.S.—Saw your Ad in ROCKS AND MINERALS.

## WHERE AND HOW TO FIND MINERALS

By MORRELL G. BIERNBAUM,  
*Honorary President, Rocks and Minerals Association*

Most beginners, in the study of mineralogy, sooner or later ask that question: "Where do we look for specimens?" A further question that comes up later is "How do we find them when we get there?" As these two questions are so closely allied, I believe it best to consider them as one.

In order to properly approach the question, a few fundamentals will have to be considered. A mineral, in the usual sense, is a natural solid element or individual chemical compound of definite form and physical characteristics. A rock is usually a mixture of minerals, although this is not absolute as in the case of marbles and serpentines, in which the white limestone or marble is pure calcite and the rock known as *serpentine* is composed, in most parts, of the mineral *serpentine*. However, in both the above cases, minerals of distinctly different composition and characteristics occur in these rock formations, sometimes in considerable quantities, and, as the above cases represent but two minerals of a total of over 1,000, they can be considered exceptions to the general rule. Ice is, strictly speaking, a mineral, but minerals are usually confined to the compounds containing at least one solid element; that is, solid in our normal temperature range. Mercury is the sole exception to this rule, but it is a metal and is classified with the other metals as iron, lead, zinc, etc. The native hydro-carbon compounds such as amber, coal, paraffin, etc., are, of course, really a connecting series between the mineral and vegetable kingdoms, and are not generally considered when one speaks of a mineral specimen.

A **DIKE** is an intrusive rock forced up originally in a molten condition by volcanic action from below, and may appear in any surface rock formation. If the intruded material spreads out at the surface, it is usually called a **FLOW**.

A **HYDROTHERMAL VEIN** is similar in physical characteristics and mode of occurrence to a dike, except that it was formed by hot-water solu-

tions being forced up from below, which, upon cooling, deposited out various minerals, some foreign to the rock formation, others derived from the dissolving action of the original solutions while passing through the rock formation itself.

**METAMORPHISM** is the result of the action of heat and pressure on certain rocks. The heat may have been caused by terrific pressure alone, or by the intrusion of dike materials, or even develop adjacent to hydrothermal veins. The resulting action consists of the segregation of the various chemical constituents of the original rock into individual minerals. An example of this would be found in a white crystalline limestone, in which the original limestone, made up of a variety of elements in one solid mass is turned into pure calcite, and many minerals occur crystallized individually in the white mass.

Another important source of mineral deposits is from percolating surface waters which, at some time in the past, had been of acid nature, dissolving up various minerals en route, and re-depositing the same or other compounds at some time later when the solutions either became super-saturated or came in contact with alkaline solutions. The minerals so re-deposited are commonly known as **SECONDARY MINERALS**. Calcite stalactite formations in limestone caves are a typical example of such secondary deposition.

Now that we have passed the consideration of these fundamentals it is necessary to have some idea of the physical characteristics and chemical composition of the various rock formations.

**A. LIMESTONE.** The limestones, as well as the sandstones, shales, conglomerates and slates, were originally deposited from sea-waters or ancient inland lakes, and are usually grouped together under the general classification of **SEDIMENTARY ROCKS**. They consequently all contain such sea and lake water ele-



ments as Calcium and Phosphorous (from bones), Carbon (from animal tissues), Magnesium, Potassium and Sodium (from various sea-water salts), etc. In appearance, the limestones must be classified into two divisions; the normal or un-metamorphosed, and the metamorphosed or crystalline limestones. Calcium Carbonate (Calcite) being the principal ingredient of limestones, and being very easily fusible, the limestones would naturally show the result of metamorphic or hydrothermal action more so than other less-fusible rocks. The normal limestone is a gray, finely-crystalline rock, frequently of bedded structure, composed in the main of an intimate mixture of impure calcite and dolomite, and consequently, easily cut with the knife-edge. The metamorphic limestone is usually a white, coarsely-crystalline, calcite mass, the cleavage quite visible to the naked eye.

**B. SANDSTONES, SHALES and CONGLOMERATES.** These formations are also sedimentary deposits but are those in which the water elements did not crystallize out of the water, only the weathered rock brought down by rivers and streams, depositing to make these formations. They were probably deposited from inland fresh-water lakes in the most part. These rocks consist of little else but sand and pebbles naturally-cemented together, usually by common Iron Oxide. They are easily recognizable by their composition and oftentimes by their bedded structure. At times, they are found as QUARTZITE, a compact hard quartz rock formed by the fusion of sand grains due to metamorphic action.

**C. SERPENTINES.** The serpentine were all intrusive rocks and consist primarily of the various forms of Magnesium Silicates. In appearance, they are of a dirty-green color. The mass is very irregular, showing no distinctive structure. Normal serpentine, having a hardness of around 4, is scratchable with a knife. At some places the serpentine rock is altered entirely to Talc, which, of course, is easily recognizable by its softness.

**D. TRAPS.** The trap rocks all belong to the intrusive dike or flow group of formations and are composed primarily of various aluminum silicates. In appearance, they always have a very dark gray to black color. They have no distinctive structure. The fine-grained varieties are very compact and hard and

break into irregular blocks. The coarse-grained varieties resemble some gneisses in appearance from a distance but do not have the layer structure of the gneisses.

**E. GNEISSES and GRANITES.** These rocks are essentially of the same composition, being primarily composed of quartz, feldspar, and mica, with some hornblende. The true granites are very coarsely crystalline intrusive rocks of no distinct general structure. The true gneisses are usually more finely crystalline in structure, higher in mica content than the granites, and occur in a layer structure, similar in appearance to the bedding characteristics of the sedimentary rocks, but formed this way by the development of crystallization of the minerals at right angles to the direction of external pressure, a well-recognized normal physical phenomenon. The true gneisses are generally considered to be the oldest rocks of the earth.

**F. PEGMATITES.** A pegmatite vein, or dike, as it is sometimes called, is a very coarse granite-like vein usually found apparently penetrating gneisses, although at times penetrating other formations. The general mineral characteristics of a pegmatite are similar to those of granites. The origin of pegmatite veins is a moot question; some believe them to be always intrusive; others believe them to be replacements. It is quite possible that either belief is correct depending on the particular vein in question. All agree, however, that they were formed subsequent to the rock formation that they are found in. In mode of occurrence, they usually run in irregular direction through the gneiss or other rocks, frequently at right angles to the layer structure. They vary in width from a few inches up to several hundred feet in certain areas. A true pegmatite vein should not be mistaken in a gneiss formation to the quartz veins which sometimes occur running parallel to the layer-structure of the gneiss. Such quartz veins are almost universally barren of minerals, being merely concentrations of silica in the gneiss rock. The pegmatites frequently contain quite a variety of rare and semi-rare minerals distinctly foreign to the surrounding rock.

**G.** There are a number of less common rocks, such as the NEPHELINE-SYENITES, which will not be discussed in this article.

The table of rock formations and





minerals accompanying this article is given with no attempt to list all the minerals to be found in any particular rock formation, but only to serve as a general guide to the beginner. A little elementary chemistry will be found to be of considerable help in the field in helping to identify certain minerals associated with a particular rock formation, as frequently the elements which are represented by the rock formation itself are reflected in the chemical analysis of the minerals found in such formation. The table, if considered in conjunction with explanatory data herein noted, will certainly serve to assist the beginner in locating minerals at the place where they should or may be found. It will serve to save him considerable wasted time at some quarries, mines, or road-cut exposures where the rocks are unproductive of mineral specimens. For instance, there is a quarry which, upon close examination, proves to be a trap rock. There is only one series of minerals to look for. These are all secondary minerals and will be found only in cracks, seams or holes in the trap rock. If there are no such openings in the rock, nothing is likely to be found there unless some previous blast had contained such cracks, in which case a glance at the rock in the quarry from the previous blast will tell you at once if there is any hope. A typical example of this is the Paterson-Bergen Hill Zeolite district of New Jersey. These formations are trap flows, and, while at certain points the zeolites are plentiful, the vast majority of the formation is merely solid trap rock, and no minerals are to be found. However, sometimes the minerals, while not plentiful, are there in small amounts, and a rock exposure should not be discarded as mineral-barren until it is looked over carefully along the lines suggested. Another example is that of a limestone quarry. Upon examination, it is found to be of the gray, fine-granular texture, typical of the unmetamorphosed limestones. Bedded structure is usually quite noticeable in such limestones. Outside of occasional cracks filled with secondary calcite crystals, or a patch of massive cleavable dolomite, little should be found UNLESS at some part of the quarry the bedded structure will be entirely eliminated and the limestones here be found quite coarsely crystalline, in which case there is distinct evidence of metamorphism of some sort. At such a place, all

the time should be spent, as this metamorphosed area is the only place where minerals are apt to be found.

The writer desires, at this point, to touch on another phase of mineral collecting. There are some localities where, while there are no hand-size specimens to be found, there certainly are some very fine specimens of small areas of minute crystals which, when broken up and mounted in a small cardboard box on a piece of cork, make truly magnificent specimens when viewed under a microscope of medium power. The collector should always bear this in mind when hunting for specimens as this offers an additional objective in the way of a mineral collection. There are several such microscopic collections in the East, some of which are a wonderful delight and surprise to the observer.

Little mention is made in the table of the metallic-element minerals. While some of these are occasionally found sparingly in almost all rock formations, the vast majority come from the various metal mines. At such localities, various of the metallic salts are frequently found in seams in and adjacent to the ore bodies. The accessory minerals occurring with such ore bodies are usually dependent primarily on the adjacent rock formations.

A final word before closing regarding the sedimentary rocks in general. There is no exact line of demarcation between the various sedimentary rocks. We have the limestones, sandstones, conglomerates, shales, and slates all included in this general class. None of them are productive of minerals (except occasional secondary minerals) excepting the metamorphosed limestones or the normal limestones with hydrothermal veins. All these rocks in their normal bedded formations, are practically barren of mineral specimens.

---

Albert Karlsson of New York, N. Y., recently made a special trip to Maine to visit some of the noted localities of that famous State and has brought back with him many choice specimens to add to his very fine collection.

---

Excellent specimens of water-worn boulders containing faults are common in the gravel deposits of the Hudson River valleys and especially around Peekskill.

## THE ROMANCE OF ROCKS AND MINERALS

By R. F. H. HARTER, M.Sc., Ph.D., F.I.S.

In an economic world, such as exists today, the struggle for existence is so intense that the mass of mankind is apt to forget the romantic past and accept it only in the realities of the present. But the men of the past were little different in nature than those of today. Nations may come, and nations may go; civilizations may rise and fall, but the animal instinct, the primordial traits, remain with modern nations and peoples. So when the first Spanish explorers brought back evidences of a new land, a land among other things that yielded precious metals, there was immediate interest where before there was only passive notice. Then followed the trails of the conquerors, always alert to plunder the wealth of the shrines of the natives.

To the early sea-faring peoples, the mountains were the homes of their deities, wonderful beyond concept, with grandeur of a gigantic frame; from thence sprung the fountains of adornments, of gold and silver, rubies and sapphires and other precious stones. Is it any wonder then, that when the Spaniards inquired from whence came the gold and silver in the shrines, the natives pointed to the highest mountains?

"Gold is where you find it," is an old saying, but certain formations, certain rocks, certain mineral groups seem in general to be associated with gold, silver, copper, nickel, chromium, tin, tungsten, vanadium, uranium, thorium, lead, zinc, iron, and most other ores. This fact is a primary one of observation well established by comparison of the principal mining districts of the world.

It is not necessary to live in a mining district to study rocks and minerals. Many localities of much geological interest are districts that yield no or little mineral wealth. Wherever a student resides there are geological, natural formations or objects, that are worthy of study, investigations, and observations. "Read nature, not books. If you study nature in books, when you go out-of-doors you cannot find her," so said the great Professor Louis Agassiz. Or as Dr. Henry Fairchild Osborn, (1) of the American

Museum of Natural History says: "There never was a day in American education history in which this observational method of Agassiz was more glaringly needed than the present day." Field trips and field study should be to the student of geology, mineralogy, petrology, and paleontology what the laboratory is to the student of chemistry, physics, or anatomy.

Mineral collecting is no doubt prehistoric, far older than mining, (2) and commenced when near-man and later, neo-man, sorted out stones, rocks and minerals that appealed to the eye. This instinct is animal in origin and there are still animals of the lower plane that will collect, store and arrange, objects that attract and appeal the sight. These same objects which pleased the eye soon became ornaments, possibly the source of the first private property known to the early peoples.

The student-collector of rocks and minerals is satisfying an honorable instinct, that of curiosity, when he collects, arranges, and studies his collection. Lucky is the person who has a genuine hobby; a horse that can be ridden in a city hotel or in an eight by ten apartment, in the humble village cottage or the lamp lighted garret of an isolated farm house; by the millionaire or by the "dollaraire." Such is the Rock and Mineral Collector.

Most mineral collections can be divided into two general groups: (a) Showy Specimens, and (b) Educational Specimens. A person desiring showy specimens often objects to putting dull, earthy minerals into his collection, no matter how important these minerals may be geologically or economically. "A thing of beauty is a joy forever," Keats said, but beauty to a scientist might be different from that of a poet.

To the collector of educational specimens, to the general student of rocks and minerals, wherever your field of interest lies, be it crystallography, descriptive, chemical, or economic mineralogy and petrology or paleontology, or paragenesis, make a complete study of each and every specimen, then index a resume to the

label, and catalog your collection, with more detailed remarks, in a numbered record book kept specifically for this purpose. In your catalog include analysis and assay if possible, if not find the approximate chemical formula and percentage for the pure minerals; give elemental percentage of the minerals; give crystallographic data; data regarding locality, occurrence, and other remarks on the source, including associated minerals, geological formation and probable age; give the history and uses of both the mineral and its constituents; cover briefly the general metallurgical treatment of the mineral or group. A valuable handbook will be so obtained, based upon the collector's specimens.

Some collectors use the Dana method of classification based upon the negative radical group; all oxides, all carbonates, all silicates, all sulphides, etc., being grouped under the oxide, carbonate, silicate, or sulphide headings, etc. Other collectors use the elemental classification in which the principal constituent of the positive radical forms the group heading; all copper minerals being grouped together whether oxides, carbonates, sulphides, etc., of copper. Either method is scientific providing the classification is complete. There are, however, many minerals which are difficult to classify by either method. The classification of rocks, or determinative petrology, is even more difficult and uncertain; the chemical classifications using as an index the silica, alumina, lime, magnesium or feldspar content, as also the megascopic and microscopic classification based upon the apparent minerals present.

In regard to labelling minerals and rocks, there are times that the collector acquires specimens that cannot be identified with any degree of accuracy. This is no disgrace and it is better to label a specimen with a question mark (?) than have a mislabel in the collection. There is only one method of determining minerals accurately and that is by chemical analysis and from it calculate the formula. Varieties may exist but these can usually be determined by the physical properties of specific gravity, hardness, refractive index, crystallography and morphology. It is easy to be mistaken in the identification of minerals; a Professor of Mineralogy in a School of Mines was once shown a sample of ore and asked what it was: "Wad ore," was the quick reply after a hasty examina-

tion. "Are you sure, Professor?" "Absolutely, glass is glass, and aluminum is aluminum; that is wad ore." But several chemical tests failed to give more than a trace of manganese to the sample that the Professor of Mineralogy was so certain to be manganese ore.

What makes one locality favorable for the deposition of economic minerals while another district of the same general or country-rock formation is barren, remains one of the mysteries of nature. Both may be faulted and fissured, and possibly have been subjected to from one to four periods of mineralization, still the one district may be highly mineralized with economic mineral groups while the other may be barren of value.

In an eroded country, wealth may lie within six inches of the surface and



A Butte "Leached Vein" or "Gossan"—located on Great Northern Railroad track and exposed by the cut. The vein is invisible from the surface or is "blind"—showing how close a vein can come to the surface and still be invisible.

pass unnoticed. Float, the ledge or vein residue of erosion, may travel far beyond the original source and cause the prospector to "cut" or "pit" in barren ground. There is hardly a space, a township square in the vast Cordellera and adjacent ranges that has not been prospected with various degrees of thoroughness. But despite the fact that hundreds, even thousands, have prospected a given area, there is always the chance of the previous ones overlooking what the eye cannot see but what a lucky swing of the pick might reveal.

Prospecting, of the blood and sweat kind, the kind that made the mines of the Mother-Lode, the Comstock, the Jib, the Rex, the Anaconda, the Yellow-Aster, the Mizpah, the Fog-Bound and many others, is nearly extinct now. It has been said that man will do anything for money; work being the bank of last recourse, and prospecting to be carried out for failure or for success means work, hard manual labor. Where riches were easily made in the early days, the prospector of today must content himself with the necessities of life and hope in the possibilities of tomorrow, for, "Has not the earth produced the billions for the 20,000 millionaires"!

Geophysical exploration (3) or modern scientific prospecting is in its infancy and no doubt will succeed the methods of by-gone years of ore-hunting. At the present time or until geophysical methods are further perfected, the old pick, hunt, and

find method of prospecting will continue, not in vogue but by reason of its utility and its possibilities of immediately opening up economic deposits which might be of value to the prospector.

Until a district is developed to some extent it is difficult to form a conclusion regarding the "prospects" of the locality. A prospector may mine a feeder or stringer vein of extreme richness while the main veins of the district may be but slightly mineralized, the reverse may also be true in certain districts. Where a vein or lead has a soft side or a streak of "gouge" between the walls or along one or both walls, the vein is of the more permanent type; where the vein is frozen to the walls it is likely to be of gash type and play-out readily. Iron, often spoke of as "the mother of all metals," is found associated in all veins to some extent, either as the oxides, sometimes as the carbonates, but more often as the sulphides. When the iron of a gold-silver district turns "white," unless other values come in, it is considered that the gold has "run-out."

There are many methods used by the experienced prospector in helping to locate an invisible vein or lead of probable ore. Quite often in the Western mountains, a streak of dead trees indicates a vein in the vicinity. The trees seem to grow to a certain uniform size, then die apparently from no visible cause. Certain flowers, shrubs, and grasses seem often to follow or avoid a vein that lies



Butte Bullwack Mine—a stockwork gloryhole of low-grade copper carbonates. Debris covers the deposit from four to twelve feet; originally no surface evidence of the ore.

close to the surface. In case of a light snow, some veins have a tendency to collect the light waves and melt the snow along the strike of the vein sooner than the snow on the surrounding detrital; some veins apparently reflect the light waves and the snow then seems to form a streak-bank which remains generally longer than the other snow. Lightning seems to strike and follow the courses of veins and outcrops.

Outcroppings and ledges are more readily located than blind veins and the old practice of following the drainage area and retrailing by the ridges and hogbacks is the practice still followed by those that "hits the sticks," the current term for mountain prospecting.

Much has been written on prospecting but no amount of didactics can ever take the place of experience in this field. How did the old-timers discover their bonanzas? Take the discovery of Alder Gulch, (4) Montana, the richest and most productive area of its size in the world and which has produced over \$225,000,000 in gold and silver and is still producing from what was previously worked or left as too lean. Take the words of Henry F. Edgar, (5) a leader of the discovery party.

"In February, 1863, I left Bannack in company with Bill Fairweather, Barney Hughes, Tom Coover, Harry Rodgers, and Mike Sweeny. . . . We went over to the Stinking Water, now the Ruby River, and camped. . . . We went up the divide between Ramshorn and Bivens Gulches and on over into Meadow Creek and across the Gallatin Valley and from there into the Yellowstone country and on to the Big Horn where we were captured by the Indians one morning after daylight. The Indians took us to their camp and "made medicine" over us for three days, trying to decide whether to kill us or not. Finally, they took everything from us but our horses and a few other things and let us go. . . . The last Indians we saw were at the present site of the town of Bozeman, Mont., where we had a little fight with them. From there we came on up the Madison Wigwam Gulch; thence up that gulch by Bald Mountain and across by the lakes and struck what is now Alder Gulch at a point near where the old toll gate used to be.

### Discovery of Alder Gulch

This was about four o'clock, May 26th. We went into camp at this place. . . . After we had eaten, the other members of the party went up the gulch prospecting and left Fairweather and me at camp to look after the horses. Fairweather went down a little ways to see if he could find some grass for the horses but came back pretty soon and said that he saw a place across there where the bedrock was exposed and suggested that we do a little prospecting ourselves. We took a gold pan and a butcher knife and went to the place which was on the west side of the gulch at its narrowest point and filled the pan. I took the pan of dirt and went down to the creek and began to wash it, when Bill, who was picking at the bedrock with the butcher knife, called to me: "I got a scad." I replied: "Well, if you have one, I have a thousand." And sure enough I had too. We panned two more pans . . . and as it was getting dark we went back to camp. Our washings amounted to \$12.80. . . .

The next morning we were all up bright and early and went to panning. Sweeny and Rodgers went down the gulch and made a discovery and staked their claims at the foot of what is now Wallace Street; Coover and Hughes went up the gulch and made a discovery somewhere near the head of the flume now owned by the Alder Gulch Consolidated Company; and Fairweather and myself staked our claims at the original discovery. We panned most of the day and washed out about \$180 in all. . . .

### The Naming of the Gulch

That night we had a consultation and decided to stake off two claims of 100 feet each for each man in the party, and concluded to go back to Bannack for supplies but to keep our discovery secret. The next morning, May 28th, we made ready to start for Bannack but concluded to locate for water before going back. I started to write a location notice and right there arose a question of naming the gulch. Various names were proposed and finally the boys said they would leave it to me and I could write it whatever I wanted to and I said: "Well, I will call it after the bushes along the creek." I wrote it Alder Gulch, and Alder Gulch it is to this day.



### Coover Gave Thing Away

We started for Bannack and made it in two days. I guess Coover gave the thing away by telling his partner, Colonel McClain, about it. Well, we got our supplies and stayed in Bannack with our horses saddled, for two or three days, watching an opportunity to evade the crowd but finally made a start anyhow. When we got to Beaverhead Rock, now known as Point of Rocks, there must have been 150 or 200 men along with us. We decided to stop and hold a consultation with them. Colonel McClain was made chairman and I was made spokesman for our party. I told them what we had found and showed them some of the dust and said that we would show them the place only on condition that the claims that we had already located should still be held by us unmolested and not subject to be jumped under any consideration or at any time. The crowd readily agreed to this. I told them further that we would not tell them the location of the gulch but would lead them slowly on so that the ones on foot might have an even show with the others. We then started on. I was leading the party and I want to say right here that I was not dressed very richly for the leader of as big an army as I had. I had a poncho over my head, no hat, one trouser leg off above the knee and the other at the knee. Both of my shirt sleeves had gone prospecting too, but I guess I was as well off as most of the men who were following me. Well, we came on until we

got to this side of the present town of Laurin, just at the mouth of the gulch, and I stopped my horse, turned to the crowd and said: "Well, gentlemen, here is the gulch," and there was such a stampede as I have never seen before or since. The men on horseback left their pack-horses and the men on foot threw down their blankets and grub, and flew. I shall never forget that day as long as I live."

### References

(1) Dr. Henry Fairchild Osborn on Louis Agassiz and the Hall of Fame. *Science*, Vol. LXVII, No. 1743, page 523.

(2) "Mining and its allied operations have been connected so intimately with the progress of man that a history of mining would be a history of civilization from the stone age to the present age of alloys. Certainly mining operations have contributed to the foundation of advancement; and because of their utility to the human race the mining products which have been so necessary to the past advancement of human endeavor will be greater in the future progress of the race than in the past. Civilization can be measured in terms of the use of mining products. . . . While agriculture is a necessity for existence, mining is a necessity for progress. Way back in the days when near-man husbanded nature's fields and forests for food he was still all animal; but when this near-man started the first mining operations, that of gathering jasper, and flint, and chert, and



Map of Montana, showing Butte and other cities.



fashioned them for useful tools, he became a man. That mining is prehistoric must be admitted."

Fancies on the Future of the Mining Industry — R. F. H. H. The Mining Truth, Vol. XIII, No. VII, page 5.

(3) For a general and popular account of geophysical exploration, consult Tech. Paper 420, U. S. Bureau of Mines — "Geophysical Methods of Prospecting," by A. S. Eve and D. A. Keys.

(4) Alder Gulch is located about 72 miles southeast of Butte. Virginia City, located at the head of the gulch, was once the capital of territorial Montana, and had a mining population of 25,000 in 1865; today it is a sleeping village of about 400, but county seat of Madison County, a large mineral area.

(5) From the Proceedings of the Fourteenth Annual Meeting of the Society of Montana Pioneers, Virginia City, Montana, August 26, 1899.

## MINERAL LOCALITIES OF COLORADO

By EDWIN OVER, JR.  
2528 Pine Street, Pueblo, Colo.

### THE MT. ANTERO AQUAMARINE LOCALITY.

This last July, I made a collecting trip to Mt. Antero, Colo., long famous for its aquamarines and associated minerals. In a mineralogical area, between the elevations of 13,000 and 14,000 feet, I collected the following minerals:

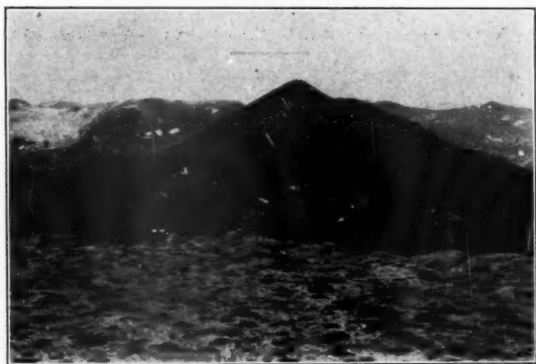
Aquamarine	Mica
Bertrandite	Phenacite
Fluorite	Quartz

My camp was at a prospector's cabin, at an elevation just below 9,000 feet, and to reach the most desirable localities it was necessary to walk 7 or 8 miles and gain 5,000 to 6,000 feet in elevation. The greatest difficulty to overcome was the loose slide rock which covers most of the country above timberline. Traveling over this loose rock is dangerous though it undoubtedly covers much good prospecting territory. Other inconveniences were the frequent hail and electrical storms which prevail at these high altitudes. I experienced hail storms on all of the four trips I made, but in only one case was there an electrical display. This was at an elevation of about 14,000 feet while on the way to the top of Mt.

Antero (14,235 feet) and during a hail storm. All of my tools buzzed in a rising and falling crescendo.

All the likely areas explored were on Mt. Antero or on White Mountain, just to the south. On the south ridge of Antero and at an elevation of approximately 13,900 feet, etched aquamarine crystals, very good phenacite crystals, and some rather poor bertrandite crystals were found. Some of the phenacite crystals were implanted on aquamarine or quartz crystals. Here there is an 18 inch vein of disintegrated aquamarine, underlaid with several inches of fluorspar, exposed in an old prospect hole. This fluorspar probably played a part in the etching of the aquamarine and the subsequent deposition of the phenacite and bertrandite. Further down this ridge a few small but excellent aquamarine crystals were obtained.

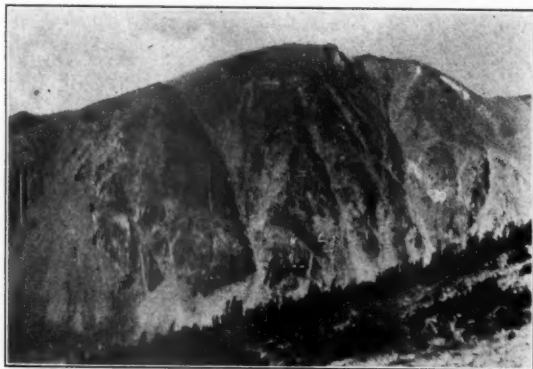
On the western end of White Mountain are numerous small prospect holes, but no good material was found. Further east, along the north slope of the mountain, are several large veins of milky-white quartz. These contain open seams lined with brilliant clear quartz crystals



Calico Mountain—just west of Mt. Antero. The foreground is the top of a ridge at an elevation of 13,900 feet, and here Mr. Over obtained some of his best specimens.

up to 3 inches in length. Just above here, on the very top of the mountain, the head of a pegmatite vein is exposed for a few feet, although the rest of it is deeply buried under the slide rock. Here I found a few small aquamarines of a very simple habit, being terminated by only the basal pinacoid. Groups of smoky quartz crystals on a feldspar base and having the bases of the individual crystals surrounded by flower-like mica crystals were fairly abundant. A few small phenacite crystals were found implanted on the smoky quartz.

Any one making a trip to this locality is almost certain to be rewarded by finding some good specimens. The scenery alone is a sufficient reward, giving views of rugged peaks surrounded by steep-sided cirques containing deep-blue glacial lakes. Wild life is abundant—one day I saw five elk and six deer. Above the timberline the ground is covered with brilliant colored alpine flowers. The altitude of the mineralized belt and the picturesque surroundings makes this spot unique among American mineral localities.



The northern exposure of the east end of White Mountain taken from the east ridge of Mt. Antero just below timberline.

## JELLY CHEMISTRY

By EDWARD CAHEN, A.R.C.Sc., F.I.C., F.C.S.  
(Author of *"The Mineralogy of the Rarer Metals"*)

Should some pedagogue from Mars come down to earth he would, no doubt, classify mankind into two distinct varieties: those who want to know the why and the wherefore of natural phenomena—the searchers after truth—and those who say, "What is the good of it all?" Franklin, so the story goes, was once witnessing the first demonstration of a purely scientific discovery, when he heard the people around him saying, "But what is the use of it?" He at once turned to them with the retort, "What is the use of a new-born child?" The "what-is-the-good-of-it-all?" variety is by far the more numerous, and unless they can see money in the inventions of the other class, they always shout their slogan.

The subject of this article is just such a one as would provoke them. It is a small backwater of chemistry in which just a few workers have interested themselves. There is certainly no money in it and no great industry will be founded on the results of these men's labors. Yet

they have been able to offer some very plausible explanations of several natural phenomena which for long have been tacitly accepted by the majority and have only puzzled the few. Such phenomena are involved in the questions as to how the agate got its bands, how the tree trunk produces its annual rings, and how the gold got into the quartz? These and other related enigmas, which at first puzzled the scientists, have in a large measure been made clear during the last few years, but there is much yet that requires further study. The reactions which occur between various chemical substances in solution in water had long been studied before it struck one to try and find out what happened when these selfsame bodies came across each other in such an unusual medium as jelly.

### Thomas Graham, Liesegang and Hatschek's Work.

Thomas Graham, however, as early as 1861, had found out that chemicals would

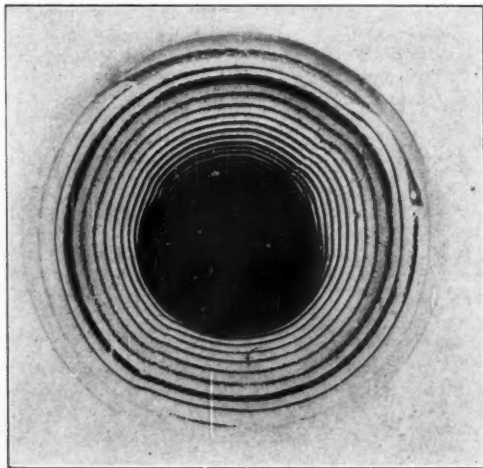


Fig. 1. Liesegangs Rings—produced in gelatine by the interaction of potassium bichromate and silver nitrate.

diffuse into and out of jellies, and, of course, all the processes of photography, such as developing, fixing, and toning, are known to depend upon this principle.

But the pioneer in the particular branch of this subject of which we are going to learn something, was Liesegang of Frankfort. It was in 1896 that Liesegang made the curious discovery which takes its name after him. He dissolved a little ordinary bichromate of potash in gelatine, just enough to give it a pale yellow color, and spread a thin film of this solution on a glass plate. This he allowed to set, and then let a drop of silver nitrate dissolved in water to fall on the center of his prepared plate. The silver nitrate reacted with the bichromate and formed the red colored silver chromate just as it does in water; but instead of spreading out uniformly all over the plate, as it might reasonably have been expected to do, it was seen to form the most beautiful series of concentric rings (Fig. 1) which were alternated with spaces where there were no colored salt. An appearance was thus fixed in the solid gelatine which closely resembles the rings one sees when a stone is thrown into still water, the rings separating further and further apart as they leave the center.

This "Liesegang phenomenon," as it has been called, has since been studied by Hatschek, Bechold, Ziegler, and others; first in such organic jellies as gelatine and agar, later in gelatinous silica.

The experiments can be performed in many ways. Hatschek favors the test tube; he puts his jelly, containing one of the reacting chemicals in the tube and allows it to set, then he pours the other reagent in solution in water on the top of the jelly in the tube.

Another method is to fill the bend of a U shaped tube with the jelly alone, allow it to set, and pour the two reagents in solution in water into the two arms; these two chemicals then diffuse slowly into the jelly and meet somewhere about the middle of the bottom of the U. In either case, the rings are seen end on. No matter how the experiments are performed, provided always the concentration of the solutions are correct, the same phenomena will be observed; beautiful rings will be formed one after the other. Sometimes they are so fine as to be hardly visible; at other times they form well-defined broad bands. The experiments are not difficult to perform with a

little ordinary care and scrupulous cleanliness, but they require patience, for, like Rome, the rings are not built in a day.

Perhaps the easiest experiment to try is one in which lead nitrate is dissolved in the jelly, and potassium iodide is poured on top. Bright yellow stratifications of lead iodide is the resulting effect obtained. To get the finest results, however, considerable practice is needed. Hatschek has become a veritable wizard, being able to perform many marvels with his little tubes of jelly. Fig. 2 (reproduced by the kindness of the *Biochemical Journal* for July, 1920), shows some of his latest conjuring tricks. These six tubes were all made with trisodium phosphate in the jelly and various salts of calcium dissolved in water and poured on top. The result of the interaction of these two very common chemicals when they encounter one another in the jelly surroundings is the deposition of a precipitate, just as would happen had they met in water, a precipitate of calcium phosphate (the material of which our bones are made). Instead of the whole tube being filled, as would have happened in water, with an uninteresting white mass from top to bottom, what do we find? The most astonishing diversity of beautiful stratifications. Their very diversity is a matter for wonder, and even their author admits that it is impossible even to guess at the reason for the strange variety or behavior of these two simple interacting chemicals such as these under conditions which were, on the whole, very much the same in all the experiments. At the end of the article in the *Biological Journal*, in which an account of these results were given, the author remarked, "While the results, therefore, enormously increase the difficulty—sufficiently great, even in view of the material published, hitherto—of propounding a general theory of the phenomena, they also enhance its importance to the biologist and the geologist by showing that structures of much more complicated nature than any hitherto obtained in such experiments may be the result of simple diffusion into a gel."

#### How the Agate Got Its Bands

Liesegang had used his first experiments, in which he obtained the rings of silver chromate, as an explanation of the well known ring-formation of the agate (Fig. 3). He suggested that this might be caused by iron salts diffusing into

gelatinous silica, but he carried out no experiments in support of his surmise. This was left to Hatschek to do. In 1912, Hatschek began some experiments with a view to ascertaining what really would happen when such an inorganic jelly was used in place of the organic gelatine and agar about which so much had already been found out. A silica jelly is very easily obtained in the laboratory by making use of the ordinary water-glass, the substance commonly resorted to for pickling eggs for winter use. This is the sodium salt of silicic acid and when acted on by an acid a jelly composed of silica is formed. Silica is the scientific name for ordinary quartz and there exists an immense number of minerals allied to quartz which are known as silicates. It was obvious, therefore, that if there was any results from the experiments, that that result would be of supreme interest to the geologists as offering an explanation of many observed facts. We shall see, in a moment, how these expectations were fully realized.

Hatschek acidified his water-glass with various acids and allowed the jelly thus formed to set in the test tubes. On the tops of the jellies he poured solutions of various salts, such as lead nitrate and calcium chloride, which would form insoluble precipitates with the acids he had used to make the jellies, sulphuric acid in the case of the calcium salt and hydrochloric acid with the lead salt. He then waited to see what would happen,

and in many cases his vigil lasted as long as three months, but it was well worth it for at the end of that time, although he did not get the pretty rings of which we have already spoken, he found that crystals were formed in the jelly which were much larger than any one could hope to get in water solutions. He actually followed the formation of these crystals under the microscope and was interested to find that those of calcium sulphate presented exactly the same appearance and shape as those of naturally occurring calcium sulphate—the common mineral gypsum. Furthermore, he found that by suitably altering the conditions of the experiment, he could make his crystals grow on top of the jelly in the water solution instead of in the jelly itself. Naturally, this was extremely interesting from a geological point of view, affording as it did, a possible explanation of the problem of how large crystals or crystal aggregates of very insoluble substances are found in nature, where a stalactitic or igneous origin was ruled out by the occurrence of the minerals in question. To give but one example—the pyrite nodules—which are very commonly encountered in the cliffs and on the fore-shore at Folkstone in England. Cut one of these nodules in half and it will be found that the crystals radiate to a center.

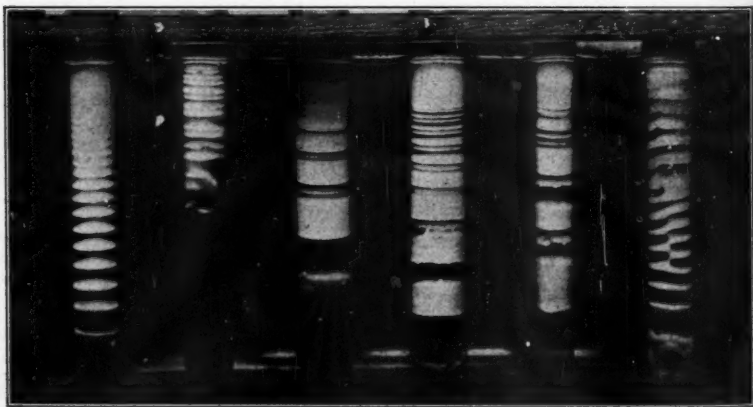


Fig. 2. Some of the conjuring tricks of Hatschek. All these were made with jelly containing trisodium phosphate with various salts of calcium.

### How the Gold Got Into the Quartz

From these experiments to others—to inquire how gold got into the quartz in which it is so often found—was no great step. This work was also done by Hatschek in conjunction with Simon. Again a silica jelly was made and before this was allowed to set in the test tubes a little gold chloride was added. When all was ready the gold salt was acted upon by various reagents which would reduce the gold solution to the metal itself. This was done in several ways, either by pouring the reducing solution on to the top of the jelly or by subjecting the whole tube to the reducing action of a gas. Without entering into minute details of how the experiments were actually carried out, let it suffice to say that gold was not only formed but actual crystals of this metal were observed with the aid of the microscope, which had the proper shape for this metal. The geological bearing of these experiments is obvious. All that has to be supposed is the initial jelly condition of the quartz; the gold solution would then diffuse into the jelly and be reduced to metal there by naturally occurring reducing media in solution or in the form of gas. That this hypothesis does not assume too much is shown by the discovery during the boring of the Simplon Tunnel of a vein of silica which was still in the gelatinous

condition and it appears that this is by no means an isolated instance. Furthermore, it was again found possible by altering the conditions of the experiment to make the gold crystals grow outside the jelly in the watery solution. It at once occurs to one to ask whether this may not furnish a very much better answer to the riddle of how it is that gold nuggets are so often found in streams in the vicinity of which no gold-bearing quartz is to be found? During the experiments, from time to time stratifications were again noticed, just like those in the organic jelly. This might conceivably explain the banded quartz containing gold which had so often been observed by miners and prospectors. Certainly the work threw a glimmer of light on the genesis of ore deposits and was full of suggestive ideas for future study. Another ringed structure in a naturally occurring mineral may here be mentioned though as yet no work has been done to explain how the rings were formed. "Wood tin" is the name given by miners and mineralogists to a peculiar form of alluvial tin found by them in many parts of the world such as Cornwall, England; Nigeria, Africa, and Bolivia, South America, to mention but three localities. The nodules are often very small and the rings can only be seen properly by means of a fairly strong lens. The rings, however, are very perfect, alternating light and dark brown in color, and derive their name from their resemblance to the rings in the section of a tree trunk.



Fig. 3. Polished section of an agate showing the well-defined bands.

### The Annual Rings in Trees

No article on the Liesegang phenomena would be complete without some little discussion of these rings (Fig. 4). Here again we are face to face with a problem which has caused but few minds to give a little time for its consideration. The fossil tree trunks of the pre-tertiary periods of our world's history are not ringed, and it was at first thought that this was due to more equable climatic conditions than those which prevail today, there being then no winter and summer. That it is not necessary to make any such assumption has been proved beyond all doubt by an experiment performed by Klebs, who took some north European deciduous trees and planted them in the island of Java where the climate is, to all intents and purposes, the same all the year round. He found



that the trees behaved exactly as if they had not been removed from their native soil. They lost their foliage regularly each year, and each year a ring was formed. This retention of periodicity under altered circumstances is usually explained away by saying that the organisms have gradually become inured to their rhythmic change and hesitate to relinquish it, but, as Liesegang very tritely remarks: "No one states what is the mechanism or the chemistry of this inurement." Klebs hesitated to attribute this function to some innate rhythm in the trees themselves and thought that it must be due to their obtaining certain salts from the soil of their island home at one period of the year which they could not get at another. Unfortunately for his theory, he mentioned that he had observed two trees side by side, one in its full summer glory, the other in its wintry garb and without a leaf on it.

Kuesters suggestion that the rings are formed in much the same way as the bands are produced in the agate seems a possible one, but, whereas Liesegang had already shown that these were caused by the diffusion of iron and other colored salts into gelatinous silica which was already there; in the case of the tree trunk the process must be a continuous one taking place synchronously with the growth of the tree.

This mysterious rhythmic agency at work in the tree itself may in some way be akin to the rhythmical precipitation of silver chromate in the gelatine of Liesegang's original experiment described at

the beginning of this article. Perhaps the rising sap may encounter dissolved salts and throw them out of solution, but, whatever the actual cause, the reaction is no simple one, as the structure is far too complete to allow of so simple an explanation.

From the few examples mentioned here it will be seen how Liesegang's curious observation in the laboratory can be made to furnish reasonable explanations of how certain and familiar forms came into existence. Every field studied by the scientist — geology, botany, biology — yields good examples of difficulties which have smoothed away by comparison with the results of a very simple experiment.

Furthermore, we are on the fringe of the present subject; much has yet to be done to extend our knowledge of the reactions which take place in jellies—organic and inorganic—under the most varying conditions.

Granite gneiss from Silver Bay on Lake George, N. Y., has on one surface — apparently a joint plane — numerous small crystals of purple fluorite. This is a new locality for fluorite but it is not exceptional to find the mineral in such an association in the Adirondack Precambrian rocks. Some of the granites actually carry fluorite as one of the mineral ingredients.



Fig. 4. Polished section through a tree trunk showing the annual rings.



---

**WESTERN NEW YORK CONODONTS\***

---

By **RAYMOND R. HIBBARD**  
68 Moselle Street, Buffalo, N. Y.

---

Occasionally we read in the daily papers and scientific journals the accounts of various museum and university expeditions which return from remote regions of the world with their valuable collections of fossils. The members of these expeditions usually travel thousands of miles in quest of their finds and in view of this fact, I thought it might interest readers of *ROCKS AND MINERALS* to know of a fauna I have been collecting from our local rocks since 1924, which at least equals some of their finds in scientific importance. The fauna in question is that of a conodont collection representing approximately (previously 175 new species), a number of new genera and all of great scientific value.

Conodonts are the teeth of some family of small fishes which flourished in the late Paleozoic seas of both this country and Europe. For a long time they were difficult to classify. Some of the early writers thought they were the teeth of Maxinoid fishes while German authors regarded them as the jaws of Annelids. Other investigators ventured to say that "they could be the teeth of naked Mollusks." However, Dr. E. O. Ulrich and Dr. Ray S. Bassler, both of the U. S. National Museum, Washington, D. C., after extended research, have reached the conclusion that some of the teeth I have collected show resemblance to those of the Selachian and Myxine fishes. They are mostly horn colored objects, highly lustrous and when weathered by acidic agents they lose their color and white teeth are then quite contrasty on the black shales. In size they are so small as to be hardly noticeable to the average collector and are easily overlooked. While most of the teeth collected rarely exceed a millimeter in length, I was fortunate, however, in finding some unusually large species attaining a length of 3 and 4 millimeters.

The conodonts collected occur in a black shale formation of the Portage group of rocks known to geologists as the Rhinestreet shale, at Shaleton, a small station on the Buffalo and Erie Railroad,

approximately 14 miles southwest of Buffalo. They have been collected later in the Middlesex shale of the Portage rocks along 18 Mile Creek, in Erie County, N. Y., and more recently I have in company with Professor W. C. Morse of the Mississippi A. and M. College, collected them from the Rhinestreet shales exposed along Pike Creek in Erie County, N. Y. These conodonts occur in the basal layers of the Rhinestreet shale in immense numbers but conditions at the Shaleton locality lately have not been so favorable for collecting them, and all through the Middlesex shale they are found but in somewhat smaller numbers. In form they are very variable and present enough rogues to make it a matter of tedious work in sorting them out. On some of the slabs of shale collected as many as 50 to 100 specimens can be counted in the space of a few square inches.

In the Rhinestreet shales the conodonts with the anterior and posterior portions of the bar equally developed, with a stout median main cusp and belonging to the genus *Bryantodus* Ulrich and Bassler, 1926 (Fig. 5) are the most abundant species met with. Two other genera (Figs. 2, 6) in which the main cusp with its basal extension is fixed at the anterior end of the bar and with a number of usually acute denticles emerging from the bar in back of it are less abundant and represent the genera *Prioniodus*, Pander, 1856 and *Ligonodina* Ulrich and Bassler, 1926. Another genus (Fig. 4) is that of *Hindeodella* Ulrich and Bassler, 1926, in which there are a few denticles developed in front of the main outer cusp with a set of usually alternating large and small denticles behind it; species of this genus are of rare occurrence. A

---

\*A similar account of the collecting of these conodonts appeared over a year ago in a Sunday edition of the *Buffalo Express* by Fletcher Pratt from notes I furnished him. For the benefit of most of the readers of *ROCKS AND MINERALS* who have not seen this article of Mr. Pratt's, the present paper has been prepared.

number of other interesting genera have been found all of which are represented by a few species of each.

Thousands of specimens of these conodonts, many of them in a remarkably fine state of preservation, have been collected and some of them have been fully described lately in two papers. A number of the more common species have been sent to Dr. Bassler and together with Dr. Ulrich they wrote a very interesting paper describing many new species and some new genera they found in the shale material sent to them. This article appeared in Volume 68 of the *Proceedings of the U. S. National Museum* for 1926. Another article in which can be found a list of all the more important papers dealing with conodonts was published in the March 1927 issue of the *American Journal of Science* and gives the results of my own study of a number of species. The illustrations of additional new species have been made and it is hoped that their descriptions will appear in print at some later date.

Associated with the conodonts, I have found beautiful examples of inarticulate brachiopods of the one genus *Lingula*. Other fossils collected are fish scales and plates and other fish remains equally well preserved. Fossil plant remains have been observed but owing to the almost structureless condition of them, none were carried home.

In this region both the black shale formations in which conodonts occur are highly bituminous and when fresh pieces of the shales are broken with a hammer they emit a strong petroleum odor. Just how the oil got into these rocks presents another subject for study but the plant and fish remains buried in these ancient sediments apparently contributed to some extent to its accumulation.

If there is a black shale formation exposed in your local region, it may well repay you to search it diligently for conodonts as well as for other microscopic objects. It would be well to carry a small pocket lens, magnifying about 12 times, so as not to overlook any specimens, should they be met with. Conodonts occur in the Devonian and Mississippian black shale formations at numerous localities in the States of Tennessee, Alabama, Kentucky, Ohio and New York. They have been reported by Hinde and others as occurring in Ontario, Canada, at Kettle Point on Lake Huron and other localities in the immediate vicinity. Dr.

E. M. Kindle of the Geological Survey of Canada, mentions the occurrence of them in the Long Rapids shale of the Moose River region of Ontario. Also, he has collected a small but interesting collection of them which I have seen, from the Fort Creek shales of the lower Mackenzie River valley, Canada; these are somewhat smaller than the specimens found in the Rhinestreet shale of New York.

The unusually fine state of preservation of most of these conodonts makes them useful for subsurface investigations and are of much value in the way of correlating geological formations at widely separated localities. Because of their small size, many of them are found complete and are much sought for by paleontologists who study the drill cores.

The specimens selected to illustrate this article were photographed with special photo-micrographic apparatus and with the aid of the ammonium chloride process which is now used universally for coating fossils for photographing.

To facilitate handling the specimens under the microscope, I saw the thin slabs of the shale up into small squares keeping the conodont as near in the center as possible. A red ink line is drawn around the specimen so it can be easily found at any time. They are then placed in glass vials with cork stoppers to keep out dust. A narrow printed label bearing the name, geological formation, locality and catalog number accompanies each specimen.

### Explanation of Plate

Fig. 1. Surface of the Rhinestreet shale from Shaleton, N. Y., enlarged 12 times showing the abundance of conodonts in the shale.

Fig. 2. *Ligonodina curvidens*, Hibbard, x12, Rhinestreet shale, Shaleton, N. Y.

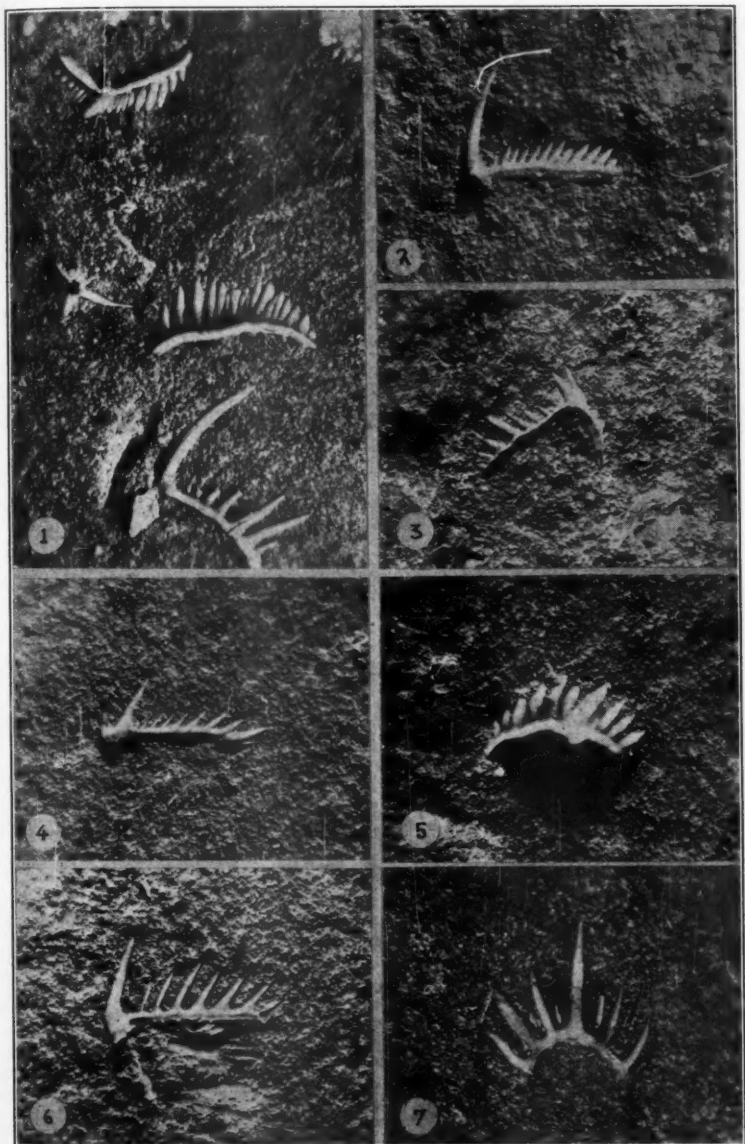
Fig. 3. *Euprioniodina bassleri*, Hibbard, x12, Rhinestreet shale, Shaleton, N. Y.

Fig. 4. *Hindeodella deflecta*, Hibbard, x12, Middlesex shale, along 18 Mile Creek, N. Y.

Fig. 5. *Bryantodus* sp., x12, Rhinestreet shale, Shaleton, N. Y.

Fig. 6. *Prioniodus mundus*, Hibbard, x12, Rhinestreet shale, Shaleton, N. Y.

Fig. 7. *Lonchodina typicalis*, Ulrich and Bassler, x12, Rhinestreet shale, Shaleton, N. Y.



WESTERN NEW YORK CONODONTS—ENLARGED .12 TIMES.

## PHOSPHORESCENCE OF MINERALS

By E. MITCHELL GUNNELL

This is a continuation of a series of articles on the intensely interesting phenomena of "cold light." It would please us to have our readers perform some of the experiments outlined in these articles. Those desiring further information are invited to correspond with Mr. Gunnell, who will be only too glad to answer questions. His address is: E. Mitchell Gunnell, 595 E. Losey Street, Galesburg, Ill.

### PART 4—BEING A DISCUSSION OF ELECTRO-LUMINESCENCE AND PHOTO-LUMINESCENCE IN MINERALS.

Electro-luminescence and photo-luminescence are by far the most important types of phosphorescence. Not only do most sensitive minerals classify under one or both of these types, but also the well-known phosphorescent paints do likewise. Since with both, the excitants are light rays, the two types may conveniently be grouped together for discussion and study.

While light does cause both these phenomena, the difference in the nature and origin of the rays themselves determines which of the types will result. Thus, phosphorescence caused by an electrical discharge of active light rays is called "electro-luminescence"; while the luminosity caused by a non-electrical discharge of active rays is "photo-luminescence." Since the active rays—when they are the ultra-violet—may be produced either electrically or non-electrically, the origin of the rays alone determines the type of luminosity resulting from an exposure to them.

There are two classes of active, excitant rays produced electrically: those produced only within a vacuum tube; and those produced by an open air discharge. Cathode rays and X-rays are of the first class; ultra-violet rays are of the second class. All three kinds of rays are invisible, but are usually accompanied by a discharge of visible, non-active light of varying brightness.

Vacuum tubes of the type important as regards the electro-luminescence of minerals are called either "Crookes tubes" after the inventor, Sir William Crookes, or "cathode tubes" because cathode rays produce phenomena illustra-

tive of "radiant matter" within them. Many minerals, such as diamond, ruby, apatite, dolomite, and calcite (Iceland spar), phosphoresce after the bombardment of cathode rays in one of these tubes. The commercial manufacture of Crookes tubes containing specimens of sensitive minerals within them involves considerable expense, and so fairly high prices are asked by the few scientific supply houses in this country which handle them. To the experimenter interested in securing such a vacuum tube, I would suggest writing Messrs. Max Kohl, of Chemnitz, Germany, for prices. X-rays, produced only in a modified Crookes tube called an "X-ray tube," cause many minerals to phosphoresce in the open air. The most outstanding examples of mineral sensitivity to X-ray are:

Willemite, radiated xline, from Franklin, N. J.

Sphalerite, var. Cleiophane, from Franklin, N. J.

Calcite, manganiferous, from Franklin, N. J.

Kunzite, xled, from San Diego Co., California.

Fluorite, green, from Cumberland, England.

Diamond from British Guiana.

If your family physician has an X-ray machine in his office, he will no doubt be glad to help you test your specimens for luminescence. Do not attempt such testing alone unless you are well acquainted with the X-ray apparatus, for danger lurks therein to the inexperienced. Many minerals, other than the

few I have listed, react positively under the X-rays, as no doubt the experimenter who tests his specimens will quickly discover. Striking and brilliant colors will glow from dull, uninteresting specimens; thus all positive results one obtains should be accurately recorded. I received a most pleasant surprise once while testing certain of my specimens under the X-ray. Picking up an ordinary looking piece of "cleiophane" sphalerite, I placed it under the bombardment of the invisible rays. Immediately it burst into life, glowing with the most beautiful orange-red color imaginable. Such unexpected results as this will delight the heart of the true collector.

Ultra-violet rays are produced electrically by the discharge between (1) the carbon electrodes of an arc light, or (2) the iron terminals of a spark gap. While the flaming arc is probably richer in ultra-violet rays than the smaller discharge of a spark gap, it is nevertheless unsuitable to the experimenter as a source of active rays. It is dangerous and clumsy to handle, and the discharge is blindingly brilliant. By inclosing an arc light in a metal box with a window of Corning glass opposite the discharge, practically all the visible light rays may be filtered out, but such an arrangement is costly and inefficient. For the small home laboratory, the simple spark gap is the cheapest and most practical electrical source of ultra-violet light. While

here lack of space forbids a detailed account of the construction of a spark gap, general directions will suffice for anyone at all familiar with electrical theory. A  $\frac{1}{4}$  K.W. transformer is connected directly to the house current (i.e., alternating current); this is hooked up to a glass plate condenser with lamp; the spark gap is connected to the condenser. Thus the house current is stepped up to about 8,000 volts. The most easily constructed spark gap is two binding posts mounted on a block of bakelite; rods of various metals may be used as the terminals, although iron seems richest in ultra-violet radiation. The cost of such an outfit is about \$10, but if one already owns a small transformer, or can procure one from an electrical shop for a short time, this figure will be more than cut in half. The main object when rigging up such an outfit is to get a good fat spark, for upon this of course depends the amount of excitant rays resulting. Since there is always more than one way to kill a cat, the ingenious experimenter will no doubt soon learn the best method to procure a rich ultra-violet discharge from his own apparatus. The following minerals are the outstanding examples of electro-luminescence after exposure to ultra-violet light:

\*See Dr. Headden's article on "Phosphorescent Calcites from Fort Collins, Colo., and Joplin, Mo.," in *The American Journal of Science*, 21, 301, 1906.

Name	Locality	Color of Luminosity
Albite	New England	White
*Aragonite, fibrous	California	White
*Borax	Borax Lake, California	White
Calcite	Near Fort Collins, Colo.	Greenish-white!
Calcite	Langban, Sweden	Reddish
*Colemanite	Borax Lake, California	Bluish-white!
*Fluorite	New Hampshire, etc.	Whitish
*Glauberite	Borax Lake, California	White
*Gypsum, var. Selenite	Ellsworth, Ohio	Light-green!
*Hanksite	Borax Lake, California	White
*Opal, var. Precious (light colored)	White Cliffs, N. S. W., Australia	White!
Pectolite, glassy xline	Northern New Jersey	White!
Sphalerite, var. Cleiophane	Franklin, New Jersey	Orange!
Spodumene, var. Kunzite	California	Orange
*Strontianite	New York, Nevada, etc.	Bluish-white
*Trona	Borax Lake, California	White
Wernerite	New York	White
*Willemite	Franklin, New Jersey	Brilliant-green!!
Wollastonite	New York	White

Many other minerals have been reported as being sensitive to ultra-violet rays, among which are the following: apatite from Haddam, Conn.; autunite, barite, calamine, chalk, dolomite, quartz, rhodonite, var. fowlerite from Franklin, N. J.; scheelite, topaz, etc. I would suggest that the experimenter expose all his specimens of these species to his electric spark in the hope that he may discover more additions to the list of "outstanding examples" of the phenomenon.

A peculiar fact will be noted by a close examination of the minerals listed—as being important phosphors after ultra-violet—and that is the number included from Borax Lake, California. Strangely enough, every mineral found in this great desert saline deposit is similarly phosphorescent to any of those listed. Similarly, the willemite from Franklin, New Jersey, is extraordinarily luminescent while that from other localities is absolutely insensitive. The "cleiophane" sphalerite from this same locality in being so electro- and tribo-luminescent, must have an atomic structure comparable to that of the artificially prepared phosphorescent zinc sulphide called "Sidot's blende" or "hexagonal blende." Few sphalerites from other localities show any marked electroluminescence, although the fine granular blende from the Horn Silver Mine, Beaver County, Utah, is remarkably triboluminescent, as described in my last article: (Triboluminescence in Minerals, June 1928 issue of ROCKS AND MINERALS). Other luminescent minerals from Franklin, N. J., include—besides the three already described—sparteite, a manganiferous calcite which fluoresces a deep orange color; leucophoenicite, which fluoresces violet, and greenockite, which fluoresces green. In view of these cases of localization of luminescent minerals, there must be some active element or elements as yet undiscovered, or else some peculiarly sensitive atomic structure common to all these minerals and to which their luminescent properties are due. The presence of a minute quantity of manganese in kunzite crystals undoubtedly has much to do with the luminescence of this mineral. The same is no doubt true of the Franklin willemite and sparteite. In carefully conducted experiments on the artificial preparation of phosphorescent zinc sulphides, it has been noted that the addition of quantities of manganese as metallic impurities resulted in a sulphide with an intense orange-red luminescence

and remarkable triboluminescence. To a smaller degree, the cleiophane sphalerite from Franklin, N. J., shows similar luminescent properties. But whether or not the luminescence of cleiophane is due to manganese, such content must necessarily be very minute in view of recorded analyses.

Certain electroluminescent calcites deserve passing notice here. I have already mentioned the Franklin, N. J., manganiferous calcite, sparteite, which fluoresces a deep color under ultra-violet light. A very compact calcite, or really a granular limestone, occurs along with the manganiferous mineral, berzelite, at Langban, Sweden. This calcite shows a strong red fluorescence under both X-ray and ultra-violet light, and a marked phosphorescence after such exposure. Three Western localities in this country have furnished luminescent calcites: the Ingleside Quarry, Ingleside, Colorado; the Alford-Maxfield Quarry, near Fort Collins, Colorado, and the Limestone Quarry, at Murke, Wyoming. These calcites have been examined by such eminent investigators as Dr. W. P. Headen,\* W. S. Andrews, and others. These calcites were tested under both cathode rays and ultra-violet rays, and gave very different results under each. The most marked difference was the bright green, yellow, or pink fluorescence under the cathode rays, as compared to the entire absence of fluorescence under the iron arc discharge. The specimens phosphoresced persistently after exposure to the two kinds of active rays. If any collector, living at or near Fort Collins, Colorado, can procure specimens of these calcites, I wish he would write me to that effect.

There are two non-electrical sources of active luminescent-excitant rays: burning magnesium ribbon, and sunlight. The active rays are ultra-violet in both cases, and so we can assume that those minerals sensitive to the discharge of the spark gap will also phosphoresce after exposure to these non-electrical excitants. This is true, but only to a relative degree. The iron spark gap, being rich in ultra-violet radiations, will excite many minerals to phosphoresce where sunlight, being both weak in active rays, and blindingly brilliant in visible light rays, will not cause these minerals to phosphoresce. Burning magnesium ribbon is a rich source of ultra-violet rays, and so is the most efficient excitant for photo-luminescence.



Magnesium ribbon may be procured at small cost from any scientific supply house. But here also, as with sunlight, we have to contend with a brilliant—a blindingly brilliant—display of white light. The best and simplest way for the experimenter to be unaffected by this bright light is to have another person hold the burning ribbon close to the phosphor being tested, while he himself stands with his back turned and eyes tightly shut. Upon the burning going out, he can turn around quickly and view the phosphorescence with eyes used to the dark. Such testing should be done only in a room black as "Stygian night." A piece of magnesium ribbon about 6 inches long should be used for each testing, and should be held with a pair of tweezers. Ventilation will be found to be necessary for such burning is accompanied by dense clouds of white smelly smoke. Those minerals in the list of "outstanding exemplars of electro-luminescence," which have an asterisk (\*) before them, all show marked photoluminescence after magnesium ribbon.

As regards exposure to sunlight, the artificially prepared sulphides react to a marked degree and much better than minerals. The phosphorescent sulphide of zinc, which is manufactured commercially in several different grades, as well as that of calcium, are highly photoluminescent after exposure to the sunlight. There is an interesting item as regards the history of photo-luminescent minerals. In 1602, Casciarlo, a shoemaker of Bologna, Italy, discovered how to make the phosphorescent barium sulphide afterwards known as "Bologna phosphorus." In a bed of clay on Mt. Paterno, near the city, he found the so-called "Bologna stone," a reddish, globular, radiated barite. He powdered this and calcined it with charcoal in a closed furnace; and noticed afterwards that when exposed to sunlight it would shine in the dark. Everybody to whom he showed this wonderful substance wanted some of it, so he made a great deal and molded it up into stick form by uniting the powder with gum. Thus was one of the earliest phosphorescent sulphides discovered! Pliny, the great classical naturalist, recorded his observation that certain diamonds glowed after standing in the sunlight. Diamonds from British Guiana are known to thus give out light in the dark.

Certain writers on the subject of lumi-

nescence make a different classification of the types as regards the excitants than I have made in this article. Under the head "photoluminescence," one writer includes as excitants; sunshine, electric spark gap, and X-rays. He makes a separate type of the luminescence caused by cathode rays, and calls this "cathode-luminescence." As excitants of electro-luminescence, he includes lightning, mercury-vapor lamp, and Geissler tubes. But since the broad definition of "electro-luminescence" includes all electrical excitants, I have seen fit to discuss "cathode-luminescence" under the inclusive heading. The electric spark gap and X-rays are certainly electrical discharges, and the active rays given off are thus electrical in origin. Ultra-violet rays, as I have explained, may be either electrical or non-electrical in origin; thus, if of the first origin, they would produce electro-luminescence in a phosphor, while if of the second they would cause photoluminescence. No more technical distinctions than this are necessary.

I would be more than pleased to hear what results experimenters who may be following out my suggestions are having. As regards this article, I am especially interested in two phases of the problem; what electrical source of active rays is being used, and what new minerals are being found to respond to tests. I suggest that experimenters give every calcite and limestone specimen they own a thorough test, for I believe that these materials, from different localities, offer great possibilities.

It is very gratifying to receive letters from our readers expressing complete satisfaction in their dealings with some of our advertisers. The Gem Shop of Wolf Creek, Mont., is enjoying a most prominent position among the collectors of the country judging by the many letters we receive commending this firm. The Gem Shop was one of the first advertisers in *ROCKS AND MINERALS* and our most loyal one too as their advertisement not only appeared in every issue of the magazine but they have sent us at least 12 subscriptions that we know of and have otherwise boosted *ROCKS AND MINERALS*. Collectors desiring good values in gems and gemmy minerals are recommended to write The Gem Shop for a selection.

A subscription to *ROCKS AND MINERALS* makes a good Christmas present.



## ZEOLITES

By P. WALTHER  
508 Muriel Parkway, Elizabeth, N. J.

The zeolites, a distinct group of hydrous silicates, are all secondary minerals. They are found mostly in cavities and veins in basic igneous rocks, such as diabase, basalt, dolerite, etc. Rarely they are found in granite or gneiss; sometimes in mineral veins and then very often with minerals which have no connection with the genesis of the zeolites.

The mother minerals of the zeolites are the feldspars, and the minerals similar to them in constitution such as elaeolite, leucite, etc. By pneumatolytic action, these minerals were dissolved out of the lower portion of the rocks and their solutions carried up into the upper portion where most of the silica was redeposited, first as quartz and then as zeolites which crystallized in cavities and veins.

One finds that the zeolites are not distributed all over the rocks but only in the upper parts. There are no amygdules at all in the lower portions of the rock which is easily explained when one takes into account that the still liquid magma would press the steam gradually upward until it came to stiffer parts of the already cooling mass. There the super-heated water, which on its way had dissolved the feldspars, would collect in more or less extended cavities when the zeolites (which chemically are nothing but hydrated feldspars or leucite hydrates) would crystallize out. Calcite is also formed and, if silica is present in excess, it crystallizes out as smoky quartz, amethyst, etc.

From feldspars rich in lime we get *Apophyllite*, *Chabasite*, *Phillipsite*, *Stilbite*, *Heulandite*, more rarely *Laumontite* and *Scolecite*, *Prehnite* and of course calcite. From sodium feldspars come *Analcite*, *Natrolite*, *Mesolite*, and *Faujasite*. The last are due also to nephelite and sodalite. Leucite is in many cases the mother mineral for analcite which forms fine pseudomorphs after that mineral, as in the Kaiserkuhl at Rotweil in Baden, Germany.

Besides the pneumatolytic method of

formation is the deposition of zeolites as *Apophyllite*, *Natrolite*, *Chabasite* and *Phillipsite*, by thermal springs as at Plombières in the Vosges Mountains, France. At Plombières, zeolites have been formed by the action of hot thermal water on the bricks and concrete of old Roman masonry. The water has a temperature of 70° C.

A third form in the generation of zeolites is meteoric-water, free of carbonic acid. Water in contact with feldspar or leucite, etc., acts on these minerals first hydrating them. The hydrated feldspars afterwards dissolve in more water and that solution is then carried into mineral veins. Thus one finds beautiful crystals of *Apophyllite* "*Ichthyophthalmite*," with lead and silver ores at Andreasberg in the Hartz Mountains, Germany; *Stilbite* with Magnetite in Sweden and Norway; *Heulandite* with Adularia, Albite and Spinel, *Natrolite* in the zircon-syenite in Norway, *Analcite* with silver ores at Andreasberg, Germany, and *Chabasite* with Agate, etc., in the melaphyre of Oberstein, Germany, etc.

In some basalt or trap quarries, as at Summit, N. J., one finds in a kind of tufa, zeolites, mostly *Stilbite*. But those zeolites are found only in the deeper parts of the tufa. When one takes into account the constituents of the zeolites, this becomes quite clear. Meteoric-water which always contains carbonic acid would change the decomposition products of the upper portions of the rock into ultimate soapstone and calcite. Only after meteoric-water has lost all its carbonic acid by forming calcites, could it form zeolites from the dissolved feldspars.

To prove the genesis of zeolites from feldspar we have pseudomorphs of *Natrolite* after *Oligoclase* and *Nepheline*; *Analcite* after *Leucite*. On the other hand, we have that chemical action reversed and one finds zeolites becoming feldspars again through loss of water and absorption of alkali. This is the reason for pseudomorphs of *Orthoclase*

after Prehnite, Laumontite and Analcite; Oligoclase after Mesolite; Nepheline after Natrolite. Other pseudomorphs are Prehnite after Analcite; Analcite after Prehnite; Prehnite after Pectolite and Natrolite; Natrolite after Analcite, Chabasite, and Phillipsite.

The final decomposition product of all zeolites besides silica, is a kind of soapstone, and one finds very excellent pseudomorphs of soapstone after most of the zeolites. Again by heating Kaolin with water in a closed glass tube one gets zeolite minerals and according to experi-

ments by Doelter, Apophyllite, Chabasite, Heulandite, Natrolite, and Scolecite, are not only soluble in pure water at between 120° and 160° C., but crystallize out again after cooling. Further mixtures of finely powdered silica, aluminum oxide and carbonate of lime or soda, when heated in a closed glass tube up to 190° C., give, on cooling, zeolites. Chabasite, or Heulandite can very easily be made by this method.

Zeolites are being manufactured lately in large quantities for the purification of water.

## PETALITE AT PERU, MAINE

By CHARLES D. MARBLE  
Ridgelyville, Maine

Dana gives Peru, Maine, as one of the localities for petalite, spodumene, and triphylite. I had lived in that town for two years and of course prospected there some but had seen no signs of these minerals. Then one day I met an old man who told me that the late Nathan Perry used to get specimens for colleges, in 1883—up on the hill back of his farm. Well, this sounded interesting for the late Mr. Perry was one of the ablest that Maine has had in the mineral field. Needless to say, this hill back of the said farm was investigated but it was a long time before the spot "marked X" was located. When found, the prospect turned out to be a narrow cut about ten feet wide by five feet deep and about 30 feet long and partly filled in with underbrush and forty-five years accumulation of forest rubbish.

I have not done any further blasting yet but the ledge seems to be a very good prospect for rare minerals. The main part or original crystallization is the regular pegmatite formation consisting of quartz, potash feldspar and muscovite, in large aggregates. The zone of secondary minerals, however, is highly interesting and yields some fine specimens. Spodumene is plentiful, sometimes as single crystals in quartz matrix but

more often in a confused mixture with cleavelandite and some petalite. There is also considerable of the altered form of triphylite, commonly called purpurite, but Dr. Palache says the preferred name is Heterosite. Purpurite is not very common in a size to make good specimens but the color is a royal purple and it makes a fine bit of color in a collection. There are small bits of columbite—so called—but the name is commonly used to cover a number of varieties and as to the exact nature of the Peru variety I could not say. The oxide of tin, cassiterite, is present in small amounts but not enough to make good specimens. An occasional scale of autunite is met with, fresh and unaltered, of yellow color with the greenish shimmer of uranium. Also there is an efflorescence or coating of greenish-yellow which may be an alteration product from the autunite but I could not be definite on that without an analysis. No pollucite was observed on or near the surface but the petalite and pollucite are persistent associates in some localities and it might fairly be expected to occur here a little deeper as it is subjected to alteration so that it is rarely found near the surface.

## MICRO-CHEMICAL STUDY OF THE METALLIC ORES AND MINERALS

By DR. H. C. DAKE  
793½ Thurman St., Portland Oregon

This is the continuation of an intensely interesting series of articles on a new method of identifying minerals, in which the minerals are polished and etched with acids. While the idea is not original, nevertheless Dr. Dake will present a number of new features, and his methods are so simple that the amateur collector can easily follow them.—THE EDITOR.

### TESTS FOR THE ELEMENTS BY MICRO-CHEMICAL METHODS.

In working with an unknown or doubtful mineral, it is often desirable to make determinations for one or more of the elements. The tests outlined below are obviously not quantitative, but are sufficiently sensitive to detect reasonably minute amounts of the elements. In the use of this method the mineral must first be brought into solution, that the element present may react with the reagent, to give characteristic precipitate or color. The reactions are all observed under the microscope.

The reagent may be applied directly to the polished surface or a small amount of the material to be tested can be removed from the specimen, transferred to a glass slide and there tested. Pyrex glass slides are best as they are not liable to crack when heated, although the ordinary glass microscopic slides can be used. It is not necessary to have a polished surface to test for the elements, if a small amount of the mineral in question can be isolated from the specimen in the rough. If the mineral is seen to be present on the polished surface in only minute amounts, it may be quite difficult to remove a fragment, in which case the reagent can be applied directly and after solution has taken place the reagent transferred to a glass slide by means of a capillary glass tube. As a rule, better results will be obtained by working with isolated material. A small amount of the mineral can usually be scratched from the polished surface with a bevelled needle point and gathered up with a moistened toothpick point which is then dipped into a drop of water on the slide, the water evaporated by warming before applying

the reagent.

If the material has already been subjected to etching tests, the reagent in which the mineral is soluble will be known. Most of the minerals are soluble in nitric or hydrochloric acids. If not soluble in these acids, the following can be tried: aqua regia, potassium hydroxide or potassium cyanide solution. Gentle heating of the slide will assist solution of the minerals which are slowly or difficultly soluble.

#### Tests for the Elements

**Copper**—Dissolve the mineral in nitric acid, evaporate acid by gently heating the slide. Add a drop of water and then a drop of ammonium mercuric sulphocyanide solution. Radiating yellowish-green crystals will appear, slowly or rapidly, depending upon the amount of copper present. Copper salts color all acid solutions either green or blue.

**Silver**—Dissolve the mineral in nitric acid. Add a drop of dilute hydrochloric acid and a heavy white precipitate will appear. This precipitate of silver chloride is soluble in an excess of ammonium hydroxide.

**Antimony**—Treat the mineral with nitric acid. Evaporate the acid by gently heating slide, add water and evaporate again. Redissolve the residue in dilute hydrochloric acid. On opposite sides of the drop of hydrochloric acid place a crystal each of cesium chloride and potassium iodide. A brick-red precipitate indicates antimony. This same test can be used for bismuth but the precipitate formed is much darker in color. Aqua

regia may be necessary to dissolve some bismuth minerals.

*Arsenic*—Dissolve the mineral in nitric acid using gentle heat to assist solution. Add a drop of two per cent. ammonium molybdate solution, warm gently and allow to cool. A canary-yellow precipitate slowly appears.

*Iron*—Dissolve the mineral in nitric acid and a drop of potassium ferrocyanide solution. Iron gives a blue coloration.

*Nickel*—Dissolve the mineral in aqua regia and add sufficient ammonia to make slightly alkaline (testing with litmus paper). Place a drop of dimethyl glyoxime solution near the drop and allow the two to touch. If nickel is present a characteristic pink precipitate forms which soon changes to acicular crystals. This test is very distinctive.

*Lead*—(1) Dissolve the mineral in nitric acid, evaporate to nearly dryness

and add a drop of water and then a crystal of potassium iodide. Lead gives a precipitate of yellow hexagonal crystals. In this test, if the solution blackens upon the addition of potassium iodide, repeat the test and evaporate the nitric acid twice with water added. Too much nitric acid must not be present when the potassium iodide is added.

(2) Dissolve the mineral in nitric acid and add a grain of metallic zinc. The lead will deposit upon the zinc in a dendritic growth.

Most of the above tests for the elements are quite sensitive and accurate. It will be found that the presence of certain other minerals or elements may interfere with the reaction to a greater or less extent. With this in mind, it is advisable that the student carry out the above tests on a number of known minerals that he may become familiar with the reactions before attempting work with unknown minerals.

## WITH OUR CONTRIBUTORS

In this issue of ROCKS AND MINERALS we introduce to our readers a new contributor, Mr. Raymond Hibbard of Buffalo, N. Y. Mr. Hibbard has given us not only a most interesting article upon conodonts but a suggestion to those who may be fond of collecting fossils that they examine the shales they meet with for these remains. In examining the shales, one should use a mineral glass of at least 12 magnifying power. Mr. Hibbard will undoubtedly be pleased to hear from any of our readers who may be fortunate enough to discover any of these fossils.

Edwin Over, Jr., of Pueblo, Colo., an enthusiastic mineral collector, is another contributor new to the readers of ROCKS AND MINERALS. He gives us a most interesting account of a prospecting trip

which he made this last summer to Mt. Antero, a noted aquamarine locality. On this trip Mr. Over secured quite a supply of mineral specimens some of which he mentions in his article. Our readers, we are sure, will be pleased to know that Mr. Over has promised us other articles on the minerals of the Florissant region, Ruby Mountain, Crystal Park, and the zeolite locality on N. Table Mountain, which will appear in future issues of the magazine.

William Parrish, one of our young members from Philadelphia, Pa., visited Clay Center, Ohio, during the summer and collected many fine crystals of Celestite. It is very gratifying to have our young members so keenly interested in minerals as to travel long distances in search of specimens.

## A COMPILATION OF GEM NAMES

By GILBERT HART

P. O. Box 2005, Birmingham, Ala.

Mr. Hart and ROCKS AND MINERALS will be glad to have readers send in additional gem stone names not here included or suggestions as to any corrections in names which they believe should be made.

This is a continuation of the very interesting compilation of gem names (the largest ever printed) made by Mr. Hart, the first installment of which appeared in the December, 1927, issue of the magazine. This list will be continued until completed.—The Editor.

**Damourite**—muscovite, compact.  
**Danburite**—orthorhombic, massive; colored white or pale; hardness 7, specific gravity 3.00; calcium borosilicate, also called **Barstowite**.  
**Datolite**—monoclinic, usually massive, usually green; hardness 5 to 5.5, specific gravity 2.95; calcium borosilicate with hydroxyl radicle; also called **Botryolite**, **Humboldtite**.  
**Dauphine Diamond**—quartz, rock crystal from Dauphine, France.  
**Davidsonite**—beryl, yellowish green.  
**Delawareite**—feldspar, aventurine, from Delaware Co., Penna.  
**Delessite**—an imperfectly known chloritic mineral.  
**Delphinite**—epidote, transparent, yellow-green.  
**Demantoid**—andradite garnet, olive green to brown.  
**Dendrite**—an inclusion or crystallite of some foreign mineral within a gem, usually in the shape of skeleton crystals, which resemble trees.  
**Dendritic Agate**—moss agate.  
**Derbyshire Blue John**—fluorite, from Derbyshire, England.  
**Derby Spar, Derbyshire Spar**—fluorite, Blue John from Derbyshire, England; (2) gypsum, alabaster variety.  
**Diallage**—hedenbergite, greenish, thin foliated.  
**Diamond**—isometric, usually rounded octahedron; colorless when pure, colors due to some foreign element; hardness 10, specific gravity 2.52; pure carbon. Varietal names: **Arkansas Diamond**, **Bahia**, **Ballas**, **Brait**, **Brazilian Diamond**, **Brilliant**, **Cabary**, **Cape Diamond**, **Carbonado**, **First**

**Water, Golconda Diamond**, **Jager**, **Jargon**, **Ripe Diamond**.  
**"Diamond"** used with a locality suffix in application to rock crystal.  
**Diamond Spar**—corundum, colorless.  
**Diaspore**—orthorhombic, acicular prisms or massive; color white; hardness 6.5, specific gravity 3.40; hydrous oxide of aluminum.  
**Dichroite**—cordierite.  
**Diopside**—member of the pyroxene group of silicates; monoclinic, usually massive; white to green; hardness 5 to 6, specific gravity 3.29; silicate of calcium and magnesium; gem names: **Alalite**, **Canaanite**, **Chrome Diopside**, **Malacolite**, **Pink Wollastonite**, **Traversellite**, **Violane**.  
**Diopase**—hexagonal, massive, green; hardness 5, specific gravity 3.35; hydrous silicate of copper; gem names: **Achirite**, **Congo Emerald**, **Copper Emerald**, **Emerald Copper**, **Emerald Malachite**, **Emeraldine**.  
**Disluite**—spinel, yellow to grayish brown.  
**Disthene**—kyanite.  
**Doublet**—a true gem cemented to glass or an inferior stone which is cut and colored to resemble the true gem.  
**Dragonite**—quartz, rock crystal in water-worn pebbles, brilliant luster.  
**Dravite**—tourmaline, brown.  
**Drop-of-Water**—topaz, water-worn and rounded, colorless, transparent.  
**Drusy Quartz**—small quartz crystals in parallel growth as crusts, usually from geodes or central parts of veins.  
**Dumortierite**—orthorhombic, usually aggregates of fibres; blue; hardness

- 7, specific gravity 3.31; silicate of aluminum.
- Dysluite**—gahnite, yellow to grayish brown.
- Edelite**—prehnite from Aedelfors, Sweden.
- Edisonite**—turquoise, mottled blue; (2) rutile, golden to brown.
- Egeran**—vesuvianite from Eger, Bohemia.
- Egyptian Alabaster**—calcite, from Thebes.
- Egyptian Jasper, Egyptian Pebble**—quartz, jasper variety, banded in yellow, red, brown or black in wide parallel bands.
- Elaolite**—nephelite.
- Eldoradoite**—quartz, iridescent, from Eldorado County, Calif.
- Elie Ruby**—pyrope, ruby red, from Elie, Fifeshire, Scotland.
- Emerald**—beryl, green.
- "Emerald"**—used with descriptive adjective or locality name to indicate a green stone, usually of inferior grade.
- Emerald Copper**—diopase.
- Emerald Malachite**—diopase.
- Emeraldine**—chalcedony, artificially stained green.
- Emeralite**—tourmaline, green to bluish green.
- Emerandine**—diopase.
- Enhydros**—chalcedony, hollow containing water with a movable bubble.
- Enstatite**—member of pyroxene group of silicates; orthorhombic, massive; green of varied shade; hardness 5.5, specific gravity 3.25; silicate of magnesium; gem names: **Bastite, Bronzite, Green Garnet, Schiller Spar.**
- Ephialtes Stone**—quartz, flint.
- Epidote**—Monoclinic, usually massive; green; hardness 6 to 7, specific gravity 3.51; silicate of calcium, aluminum and iron, with hydroxyl; gem names: **Achmatite, Arendalite, Delphinite, Oisanite, Piedmontite, Pistacite, Thallite, Withamite.**
- Essonite**—grossularite, yellow.
- Euclase**—monoclinic, usually in prisms; green to blue; hardness 7.5, specific gravity 3.07; hydrous silicate of beryllium and aluminum.
- Eupyrchroite**—apatite, concentric banded structure.
- Euxenite**—orthorhombic, habit massive; brown; hardness 6.5, specific gravity 4.80; niobo-tantalate of yttrium.
- Evening Emerald**—peridot.
- "Eye"**—term applied with various animal names to minerals having resemblance to an eye through such structures as agate, or which show chatoyancy, a line of light reflected from the interior, when cut cabochon.
- Eye Agate**—agate, concentric rings with dark center; (2) thomsonite.
- Eye Stone**—agate, concentric bands with center more highly colored than rest of stone; (2) thomsonite.
- Ezteri**—quartz, bloodstone, green jasper with reddish veins.

## U. S. CIVIL SERVICE OPPORTUNITIES

For those who are interested we are pleased to announce the following open competitive examination to be held in the near future by the U. S. Civil Service Commission:

### Junior Mining Engineer

Application for the above examination must be on file with the Commission at Washington, D. C., not later than January 22, 1929.

The examination is to fill vacancies

in various branches of the service throughout the United States.

The entrance salary is \$2,000 a year. Higher-salaried positions are filled through promotion.

Full information may be obtained from the U. S. Civil Service Commission, Washington, D. C., or from the secretary of the U. S. Civil Service Board of Examiners at the post office or custom house in any city.



## THE GEM DEPARTMENT

Conducted by  
GILBERT HART

Each issue Mr. Hart will give in this department information concerning gems and gem minerals. As Mr. Hart invites correspondence relating to the department, letters should be addressed to him as follows:

Gilbert Hart, P. O. Box 2005, Birmingham, Ala.

### CHRYSOBERYL

Chrysoberyl is a very old name, and was applied by the ancient Greeks to a brilliant yellowish green gem, probably our modern beryl. Like most other gem-names of ancient origin it refers to color (chrysos-gold, beryllos from some unknown root meaning green) with no connotation which serves to identify the actual mineral; in fact it is highly probable that no definite mineral was meant, only a gem of the requisite color.

As a mineralogical species chrysoberyl dates from the last quarter of the 18th century when Werner identified it as distinct from other known minerals, and gave it that name. From his descriptions and subsequent studies by other mineralogists, its characteristics are very well known in spite of its limited occurrence.

It is found only in crystals or fragments such as result from the abrasion of streams. Often the crystals are in the form of twins; which may be heart-shaped with feather-like markings on one set of prism faces, or in repeated twins of three or six individuals forming a hexagonal-like unit. These may be recognized by the reentrant angles and the striations in intersecting lines. Simple crystals belong to the orthorhombic system, and are usually tabular with many small pyramidal faces.

Chrysoberyl is one of the gems which, because of its hardness, is very durable as a ring stone. It is much harder than quartz, 8.5 on the Moh's scale, and resists all the usual abrasion of wear. However, it is brittle and liable to fracture by any severe shock. Its specific gravity is high, 3.67 for the pure untwinned varieties, and this serves to distinguish it from most other gems. Optically chrysoberyl is noted for its pleochro-

ism, which is very strong. In one direction the crystal appears orange-yellow, at right angles it is emerald-green, and along the principal axis it is bright red. Its refractive index is 1.75, close to the spinels, garnets and corundum, from which it is easily distinguished by the pleochroism.

In color it is not as varied as many other gems; almost always it shows a green of different shades and intensity. A very unusual gem cut from chrysoberyl is alexandrite, whose color is emerald green by daylight, becoming a deep-red by candle light or in the tungsten electric. This stone is highly prized by the Russians because of its discovery on the birthday of a very popular czar and of its Russian occurrence. Gem chrysoberyl is usually of a yellowish-green when this stone is faceted in the style of a brilliant. Its color dispersion is low, so that it lacks the fire of diamond or zircon, and it is not nearly as attractive as other stones in this form.

The most common chrysoberyl gem is the cat's eye; a term applied to any cabochon stone which shows an opalescence and a line or ray of light resembling the contracted pupil of a feline eye. Formerly chrysoberyl was the only cat's eye, but nowadays many other minerals have been found to give this effect, and the chrysoberyl stone is often termed "True Cat's Eye" or "Ceylon Cat's Eye" to distinguish it from quartz and other inferior types, which while often as interesting when newly cut have not the durability of the true gem. Cymophane is the mineralogists' name for this opalescent stone, but it is rarely so-called by the jeweler's trade.

Chrysoberyl gems are rather rare. The faceted stone lacks the beauty demanded by the public, and the other types are



not at all common in nature. A dozen or more localities in the United States have afforded this mineral; but gem-quality stones are extremely rare, and are limited to the pegmatite region of Maine. Asia, Africa and Australia have yielded chrysoberyls in a few scattered

places. They are found in the famous gem-gravels of Ceylon, which apparently contain practically every mineral of gem hardness and transparency. The most noteworthy locality in the world is in the Urals, where several localities furnish all types of gem chrysoberyl.

## PUBLICATIONS RECENTLY RECEIVED

*Modern Divining Rods*: By R. J. Santschi, Glen Ellyn, Ill. A history and explanation of geophysical prospecting methods, including descriptions of instruments, and useful information for prospectors and treasure seekers. This is a paper bound book of 80 pages with many illustrations including index and is in 4 parts: Geophysical Prospecting; Information for Prospectors; Pseudo-Scientific Instruments; and Legends and Superstitions. A great deal of very interesting information is crowded in its pages and the book will be of value to those interested in electrical methods of discovering ore beds, simple tests for determining precious metals and diamonds, etc.

The book is in its second edition, is revised and enlarged, and sells for \$3. As Mr. Santschi is a member of the Rocks and Minerals Association, he is offering the book to other members for the attractive price of \$1. We trust that many members will avail themselves of this opportunity and will add this interesting and valuable book to their library.

*Place Names of Mineral Localities in Central Europe* By Frantisek Slavik, Ph.D., Professor of Mineralogy in the Karlova University of Praha, Foreign Correspondent of the Geological Survey of London and L. J. Spencer, M.A., Sc.D., F.R.S., Keeper of Minerals in the

British Museum (Natural History). (Reprinted from the *Mineralogical Magazine*, June 1928, Vol. XXI, No. 121, pp. 441-479.) This valuable publication will be of chief interest to those collectors who have minerals from Central European localities. The localities and minerals too are listed in many languages as English, German, Hungarian, Polish, Slovak, etc. Since the Great War, new states have been created, boundaries have been altered, and the official names of places themselves have been changed. The places are still there, but now they may be in another country and be known by another name. For example, Nagyag, Transylvania, Hungary (the type locality for Nagyagite) is now Sacaramb, Roumania.

*Eleventh List of New Mineral Names*: By L. J. Spencer, M.A., Sc.D., F.R.S., Keeper of Minerals in the British Museum (Natural History). (Reprinted from the *Mineralogical Magazine*, September 1928, Vol. XXI, No. 122, pp. 556-582.) This is another valuable addition to a mineralogical library as it lists a series of minerals that were recently discovered. A brief description accompanies each mineral.

The above two publications are published by Mr. Humphrey Milford, Oxford University Press, Amen House, Warwick Square, London, E.C. 4, England.

Harold McConnell of Boulder, Colo., recently made an extensive field trip in search of minerals and visited localities in California, Oregon, Nevada and Utah. We are very sure that Mr. McConnell has made a valuable addition to his large stock of minerals and may offer these to collectors in the near future.

H. E. Billings, Box 165, Lead, S. D., is interested in making artistic ornaments out of vases, pottery, etc., by covering such with minerals, crystals and rocks. We are very sure that Mr. Billings would be glad to hear from any member who may be similarly interested.

## WITH OUR MEMBERS

We have received the following letter from Mr. Wm. H. Broadwell replying to the article of Mr. Bates: "Disposition of Mineral Collections," which appeared in the June 1928 issue of **ROCKS AND MINERALS**. We do not think Mr. Bates was critical as to the disposition of the Canfield Collection but rather regretful that no one in New Jersey was sufficiently interested to attempt to keep the collection within the State. Mr. Broadwell discusses this rather fully in his letter.

Mr. Peter Zodac, Editor,  
**ROCKS AND MINERALS**,  
Peekskill, N. Y.

Aug. 27, 1928.

Dear Mr. Zodac:

Since reading the article of Mr. Bates' on the disposition of two mineral collections I have felt that I must make a reply.

It was quite right that the Roebling collection should go to a national museum. This disposal was logical because the specimens it contained represented every country in the world and the selection of such a centrally located place as the National Museum was quite right and proper. But I radically disagree with Mr. Bates' expressions concerning the Canfield collection.

It is quite true that it consisted principally of New Jersey material and, for that reason, I would have liked to have seen it remain in New Jersey for the convenience of New Jerseyites. But where in New Jersey is there a place where it would have the care and attention it should have? Trenton would have been the logical place, but who is there at Trenton properly interested enough to look after it? Dr. Kummel is a geologist and not at all interested in mineralogy; Princeton certainly has mineralogists but only in the college. Is Princeton University of such importance that it could safely and properly house a collection of

such a size that it could be readily accessible to the general public? I think not.

Now about Newark. A public library is no place for a mineral collection or any kind of a collection except books; books are their specialty, let them keep to their line. The Newark Museum would have been, next to Trenton, an excellent place. But Mr. Bates does not realize that since the Newark Museum was started that it has none and never has had connected with it one who is capable to stand sponsor for a mineral collection, either of the size of Mr. Canfield's or a smaller and less valuable one. Mr. Canfield evidently realized that if placed under the care of the museum his collection would not receive the proper care and attention it should. Time has verified his judgment in his disposal of the collection. There is no better place than the National Museum at Washington, D. C.

WM. H. BROADWELL,  
Newark, N. J.

Lewis F. Crawford and son Kenneth J. of Bismarck, N. D., have recently purchased the entire mineral stock of the veteran dealer, L. W. Stilwell of Deadwood, S. D., and have formed a corporation under the name of the Kenneth J. Crawford Co., for the sale of mineral specimens and Indian relics. They have one of the largest and most complete stock of minerals, fossils, Indian relics, etc., in the Northwest and we recommend them to our readers. Both of these gentlemen are subscribers to **ROCKS AND MINERALS** and members of the Rocks and Minerals Association. We wish them every success in their new enterprise. Their advertisement appears among the back pages of the magazine.

## THE SLUICE BOX

By A. RIFFLE

"Old Bill" and I spent a day together at the Fair in Helena, Mont., looking over the mines exhibit and talking prospecting with the old timers.

About noon I suggested to my old friend that we had better go up town and get something to eat. As we got out of the taxi on Main Street I asked him where he preferred to dine. His reply was to the effect that he had not "eaten after a Chinaman for fifteen years" and that he would like to try a Chink restaurant. As we stepped out on the sidewalk after the meal I said: "Well, how did you like the Chinese grub, Bill?"

He replied: "That was a skookum good meal. I've only got one kick to make and that's on the blueberry pie. The hanging wall was too close to the foot wall."

The mines exhibit at the State Fair under the direction of Mr. Geo. B. Conway of Helena scored another success this year. The minerals native to the State were well represented and included ores of copper, gold, silver, lead, manganese, etc., together with the newer finds of zonolite, graphite, asbestos, wulfenite, vanadium, scheelite, molybdenite, and others.

The Butte School of Mines display under the direction of Mr. M. F. Haley, practical mill man of that institution was one of the most interesting features. Arraster, stamp mill, cyanide process, flotation process, ball mill, Hartz jig, etc., were demonstrated by miniature working models actually performing on a small scale the work for which they were intended. These models were constructed and operated by Mr. Haley who also informed me that he would be glad to have the readers of *ROCKS AND MINERALS* call upon him for any information that he can furnish in his line. Norman Thompson, Senior Classman, assisted Mr. Haley.

Vein models, contour models, maps and

drawings of Butte mines were also on display. These were interesting, not only because of the craftsmanship shown in constructing them, but also because some of them had served as exhibits in historic litigation.

A wall board model of the A. C. M. reduction works at Great Falls, as large as the wall of an ordinary room and showing the Missouri River in the foreground with lighted windows and smoke pouring from the "Big stack," attracted considerable attention.

The new deposit of gold and black marble at Radersburg, now being developed by the Vermont Marble Company, was represented by a large polished block of this beautiful new discovery. This deposit promises to be of great commercial importance. We were told that this variety of marble is known to occur in only one other locality, namely, Egypt.

Chromite and nickel-copper ores from Stillwater County are some other promising new discoveries.

An increasing interest is being shown in the mines exhibit every year and under the continued guidance of such men as Mr. Conway, it is reasonable to expect that this exhibit will become one of the outstanding features of the State Fair.

This is written just as the first frost has turned the leaves but will not be read until snow and ice are covering the ground and choking the streams. Therefore, "Old Bill" and myself will take this opportunity to thank the Editor and the supporters of *ROCKS AND MINERALS* for another year of congenial, if long distance, companionship and wish all of you a Merry Christmas and a very Happy and Prosperous New Year, and assure you of our continued cooperation with *ROCKS AND MINERALS* for the coming year.

## EDITORIAL

As the glad holiday season will be past and gone before the next issue of *ROCKS AND MINERALS*, we desire to take this opportunity to express to our readers and the members of the Rocks and Minerals Association, our very best and real wish that they may have a Merry Christmas and a Happy and Prosperous New Year.

We hope that our readers have found much of interest and profit in the magazine during the year that is closing. We are hoping to make *ROCKS AND MINERALS* even more attractive in its articles during the year 1929.

We have received the following letter from Victor G. Hills, Chief Engineer of the Cyprus Mines Corporation and believing it would be of interest to our readers we are reprinting it in its entirety. We hope to induce Mr. Hills to write a brief article for *ROCKS AND MINERALS* on the geology of Cyprus—an English possession in the Mediterranean.

—Editor.

August 7, 1928.

The Editor,  
*ROCKS AND MINERALS*,  
Peekskill, N. Y.

Dear Sir:

Your letter of July 20th and the two copies of *ROCKS AND MINERALS* came by our last mail.

*ROCKS AND MINERALS* I found truly interesting and particularly the articles on the ancient silver mines of Laurium, Greece, and the geology of Guam.

In regard to crystals or minerals that would make desirable cabinet specimens I am sorry to report that Cyprus is about the most thoroughly barren place I have ever found. With the exception of Selenite crystals, I have found nothing on the entire island that would be of interest to a collector. And these little Selenite crystals are not common, either. The pyrite ore which constitutes our mine output is simply the white iron in massive form and seldom exhibiting the cube form.

Strangest of all, throughout the entire island, the common mineral quartz is almost wholly wanting. No vein quartz, no rock containing quartz; not even a bit of quartz in the seashore sands can be found.

Besides the little pearly transparent crystals of Selenite, there is throughout the island, considerable crude alabaster and gypsum in large crystalline masses. This makes a plaster-of-paris product which is much used for local plastering and forms an important export product.

Besides our pyrite mine, only one other mine is in operation in Cyprus and this is an asbestos mine worked by an English company. Both the English and our mines were worked by the early Romans and furnished shrouds for cremating the bodies of their emperors.

Thanking you for your magazines, I am

Yours very sincerely,

(Signed) VICTOR G. HILLS,  
Chief Engineer, Cyprus  
Mines Corporation, Skou-  
riotissa, Nicosia, Cyprus.

Some of our readers who have been much taken with the suggestion of a code that would be descriptive of mineral specimens have promised or indicated a desire to submit some form which might be acceptable. The formulation of the code, however, is not an easy matter and requires some time in its formulation. For this reason we have as yet received no suggestions but we hope that many of our readers are engaged or are giving thought to this very interesting bit of symbolism. May we not ask that our younger readers, as well as those of more mature mind, give this matter their attention?

Mr. Diamond's contribution to the Paleontology Department for this number has been delayed and will appear in the next issue.

